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THE MANAGEMENT OF

ELECTRIC TRAMWAYS

AND

LIGHT RAILWAYS

THE MANAGEMENT OF

ELECTRIC TRAMWAYS

AND

LIGHT RAILWAYS

BY

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PREFACE.

IN this book the Author has endeavoured to deal with the subject of Electric Traction from a Commercial and Economic standpoint.

There are several excellent books dealing with the subject from a descriptive and practical point of view, but none, to the Author's knowledge, which deal so exhaustively with the Commercial Management of the same.

A satisfactory feature in writing this book has been the cordial and willing help received from gentlemen the Author has had occasion to apply to, who have all, without exception, given the information asked for, and which it is hoped will prove of much benefit to the readers.

Grateful acknowledgements are also due to General Bancroft, President of the Boston Elevated Railway Co.; to Messrs. Hewitt and Rhodes, Consulting Engineers, Manchester; to Thomas Upton, Esq., Goods Traffic Manager of the South Lancashire Tramway Co.; and to

John Young, Esq., J. M. McElroy, Esq., J. B. Hamilton, Esq., A. E. Le Rossignol, Esq., C. J. Spencer, Esq., C. R. Bellamy, Esq., and Arthur Ellis, Esq., who are the General Managers respectively of the Glasgow, Manchester, Leeds, Newcastle, Bradford, Liverpool, and Cardiff corporation tramway undertakings.

The Author has consulted special books of reference, for which due acknowledgement has been made in the text.

It is hoped that this book will be found useful to both English and American tramway officials alike.

W. R. B.

April 1904.

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THE MANAGEMENT
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ELECTRIC TRAMWAYS AND LIGHT RAILWAYS.

SECTION I.

Fundamental Principles of Management—The Staff—Details on Rolling Stock—Working and Financial Considerations.

THE attainment of the maximum revenue return with a minimum of expenditure is, or should be, the object of every corporation and general manager.

This object can only be attained by making a careful and systematic study of the various departments, officials, etc.; catering for the greatest possible passenger and other traffic (due consideration always being given to the safety of the public); and conducting the management on a good, sound, commercial basis.

One of the first conditions—in fact it may be taken as the very basic or foundation condition—to promote and assist the general manager to undertake his varied and arduous duties with commercial success, is to place under his control a tramway system which has been

constructed substantially from beginning to end; this includes the permanent way construction, overhead equipment, rolling stock, buildings, power-station plant, etc.—in fact, everything which constitutes a complete system.

This strictly important condition demands the gravest consideration; it is the very foundation of the commercial success of the enterprise. In fact, the difference between a system built upon a substantial foundation and one which is not, very often means either the commercial success or financial ruin of the undertaking.

The fact must not be lost sight of, that a tramway or light railway system is not installed to last only a few months or a few years, but is a permanent undertaking; now this means, that year after year there is a continual expenditure outlay, to cover the cost of maintenance and depreciation, renewals, etc.

This annual expenditure for the above may, therefore, be considered as the most important financial item in the upkeep of the undertaking, and, for this reason, it explains why the undertaking should be built up of the best material and workmanship possible, because, by so doing, this annual maintenance and upkeep expenditure is kept down to the lowest possible amount.

A wise and foresighted policy in the construction of the system, therefore, is to spend a few extra thousand pounds for a solid and substantial construction and equipment; then the chances are, that if we start with a good foundation (which is the only right way) that there can, and will, be built upon this foundation a structure

which will lead to the desired commercial or financial success of the enterprise.

The difference between a substantially constructed and equipped system, and one which is otherwise as regards annual expenditure, in each case; is not noticeable for the first two or three years; but after the lapse of, say, eight, ten, or fifteen years, the folly and suicidal (financial) policy of a cheaply constructed system is realised, when the maintenance and renewal expenditure absorb such a large percentage of the road earnings, that the undertaking very frequently loses money, where, otherwise, it would have no doubt been making a good profit.

It is a very easy thing for a cheaply constructed and equipped system to eat up in the course of two or three years' expensive maintenance, all of the money saved initially between the cost of a good solid system and a cheap flimsy system.

In addition to the maintenance expenses, etc., saved in a properly constructed and equipped system, there is the additional advantage that there is less liability to be called upon to pay damages for accidents caused by falling wires, bad street paving, etc., which accidents are minimised and prevented, owing to the system being properly constructed with good material and workmanship.

A second and very important element which tends to promote the successful working of an undertaking, however large or small, is to promote the harmonious working hand-in-hand of the whole staff of *employés*,

from the general manager downwards, through the whole staff, to the smallest paid position in the service.

All the different departments should work in unison and the *employés* therein. While it is impossible for all and every *employé* to have a direct financial interest in the undertaking, still, at the same time, a personal interest may be fostered, whereby, indirectly, it is to their financial benefit to work conscientiously and harmoniously for the mutual benefit of all concerned.

One such way to foster this personal interest is to pay good wages with a common-sense day's work, say an eight-hour day. Encourage the men's recreation and athletic clubs ; make contributions to the departments' Friendly Societies and Superannuation Fund, on a percentage of the profits on the working of the tramways ; always listen with a just ear to the grievances of the men ; encourage education by contributions to a suitable library ; and last, but not least, give an incentive to the men, by promotion from the ranks to those individuals who have the ability and merit, whenever the opportunity presents itself.

No general can win a battle by himself, he has to be aided by the combined efficiency and working in unison of his staff, of his officers and men. The same is true of the general manager of a large undertaking like a tramway system ; no matter how clever he is, he cannot make the undertaking a financial success without the combined assistance of his officers and men. Each and every person contributes his share to the working of the system ; and the efficiency of the men, and ultimate and per-

manent success of the organisation, depend to a great extent upon the just and equable treatment of the *employés.*

A general manager, to be just to himself and directors or corporation, must be just to the staff under him. If he tries to be too just or one-sided for either the directors or men, then his attempt fails at being just to any of the parties concerned, either to his directors, himself, or his staff.

The above element, when properly carried out with tact and judgment, is a great factor in the successful working of the undertaking, and is very often overlooked or ignored both by general managers and corporations, or directors ; this is a mistaken policy, and demands the most thoughtful consideration.

One or two corporations (amongst a number of large corporations), like Manchester and Glasgow, fully realise the importance of the above, and do the best they can for the men by paying good wages, and shortening the hours of labour, and other considerations ; they thus get better results from the men, and benefit thereby, and prevent serious strikes, etc., such for instance as that which occurred at Edinburgh some time ago.

It may be taken as an established truism, that no system can be worked "ideally" unless it has the "harmonious" and "efficient" working so desirable and essential to success.

Some persons may say that to promote this harmonious working and efficiency is easier said than done, but it is not such a difficult problem as one would

suppose ; all that is needed is the thoughtful exercise of diplomacy, tact and judgment, on the part of the directors and general manager. It is very seldom (if at all) that a large body of men present imaginary grievances for the just and honourable consideration of their employers or superiors.

Another essential condition which leads to success, is thorough organisation, general efficiency, and a broad-minded and up-to-date business policy : in fact, the secret of organising the management of a great service, is nothing more than a carefully arranged system of devolution, combined with watchful supervision.

It is not, of course, practicable for the general manager to superintend in person the every-day actions of the motor-men or conductors ; but these are under the immediate direction of the inspectors and traffic regulators ; the inspectors and traffic regulators are accountable to the traffic superintendent ; the traffic superintendent to the general manager ; and the general manager to the chairman and directors, or tramway committee. So it is with the car-shed department ; the cleaners and repairers, electricians and mechanics, etc., are directly responsible to the car-shed superintendent, he to the general manager ; then there is the permanent way engineer or superintendent, and the overhead equipment superintendent, both of whom are directly responsible to the general manager for the smooth and efficient workings of their departments.

So it goes on throughout the whole system and its several departments ; the general manager being likened

to the general of an army, who has his colonels, majors, captains, lieutenants, sergeants, corporals, etc., each of whom is in command, and responsible for his share or charge placed under his care.

If anything goes wrong, or any mishap or irregularity occurs, each of these has to bear his own share of the responsibility in turn, and thus all are kept on the alert, and each one has an interest in seeing that those subordinate to him are fit and capable in every way to discharge the duties placed upon them.

It will not be out of place here to quote some wise remarks on this point made by the late Sir George Findlay, general manager of the London and North Western Railway Company.

Coming as they do from a "self-made man," who commenced his career on the lowest rung of the ladder, and by perseverance, energy, ability and honest upright dealings, climbed up step by step, and raised himself to the position of supreme command of perhaps the greatest joint-stock undertaking in the world, a position, indeed, which has been compared to that of a commander-in-chief of an army of sixty-thousand men, with a salary equal to that of a cabinet minister, and a social standing but little inferior; they will no doubt (coming from so great an authority, the result of thirty-five years of practical experience) be given due weight, mentally digested, and considered of value.

He goes on to say, "That it is extremely difficult to lay down any hard and fast rules for the efficient management of the whole or a section of a large undertaking. If

the man who is called to the task has a talent for organisation and administration, he will be a law to himself, and if he does not possess these qualifications, no stereotyped rules will avail to supply their place. There are, however, certain maxims which are elementary, and upon which it may be worth while to insist, and these may be briefly summed up as follows :—

"1. Every man should be chosen with special reference to his suitability for the duties he is called upon to perform. To use a familiar aphorism, there should be no 'round pegs in square holes.'

"2. Care should be taken that every man entrusted with a responsible duty is thoroughly trained for its performance, and competent, before the responsibility is cast upon him.

"3. Every man should be fairly remunerated for his labour, and should be, as far as it lies with the management to make him so, a cheerful and contented servant. A discontented man makes a bad servant, for his mind is often pre-occupied by his own real or fancied grievances when it should be concentrated on his employer's business.

"4. Every man should have his duties thoroughly defined, and should know exactly what is required of him. To use another aphorism, 'What is every one's business is no one's business,' or, in other words, a piece of service which is equally the duty of two or three men is likely to be well performed by neither, for each will shift it on to the other if he can, and the one who ultimately discharges it will do so grudgingly, thinking

the others might have done it rather than himself. Moreover, if after all it is neglected, it is difficult to fix the responsibility for the omission on any one individual.

"5. There should be, at all times, active and vigilant supervision in every branch of the service. It is not enough that every man should be fit for his duties, and trained for their performance, but it must be the duty of some one to see that he does actually perform them, and that no slackness or carelessness is allowed to supervene in carrying on the working from day to day.

"To anyone who may be called upon to occupy the position of a chief official in any great undertaking, he gives one or two hints. The first discovery that any man makes on his being appointed to such a post is, that if the day consisted of forty-eight hours instead of twenty-four, and every hour were devoted to his office, his time would still be insufficient to meet the demands on it. It thus becomes essential to economise time as a precious commodity, and this is best accomplished by acting strictly upon the following maxims :—

"1. Choose your subordinates carefully and well, and let them be men you can thoroughly rely on. Do not concern yourself too much with points of detail, with which you must be fully conversant, but with which they are just as well able to deal with as you are, and reserve yourself for such matters of moment as they are not competent to decide without your authority and experience.

"2. Before any question is submitted to you for de-

cision, insist upon having all the details filled in, and all the facts before you, so that you may not have to apply your mind to it a a second time, but may decide it once and for all with a full knowledge of all its bearings.

"3. Always decline steadily to attempt to do two things at once. If you are giving an audience to one person, be it a head of department, or any other, let your door be rigidly closed to every one else for the time being.

"Let 'one at a time' be always your maxim, and act upon it strictly. The man in authority who is seen continually surrounded by a throng of subordinates, and striving to meet all their demands at once, is the man, who, by reason of excessive wear and tear, is most likely to break down in mid-career, and fail either in health or intellect; but the man who steadily concentrates his brain power upon one thing at a time, never wasting a moment, but never flurried or hurried, is the man who gets through the greatest amount of work with the least toil and harassment to himself, and in the shortest possible time.

"4. Always make a point of refusing (except, of course, in special circumstances) to see chance callers, who will occupy the best part of your time with trivial matters which could just as well be attended to by your subordinates. It is a good plan to make it a rule to see no one without an appointment made beforehand, either in writing or through your secretary, or else without previously knowing their name and the nature of their business. It is very amusing at times to see the per-

tinacious attempts which are made to break through this rule, and it can only be maintained inviolate by the agency of a wily and imperturbable secretary, and an office which can only be approached through his."

The author feels sure that it will be acknowledged that the foregoing excellent remarks contain a great amount of valuable practical advice in a very few words.

FINANCIAL CONSIDERATION.

Turning our attention more directly to some of the financial items, viz. working expenses, costs, etc., we find that in estimating the costs and allocating the expenses to the various departments of the system is a matter of the highest importance, demanding special care, skill and experience. Some of the things which have to be taken into account, and which will affect relative costs, are :—

1. Character of streets, whether straight and level, or whether they are winding and steep.

2. Density of population in the districts served, and general character of their occupations, whether resulting in a continuous loading of the cars, or heavy loads at certain times of the day only.

3. The extent of the system.

4. The frequency and speed of the service.

5. Climatic conditions of the district, demanding more or less elaborate systems of protection and means of dealing with obstructions due to such things as severe frosts, very heavy snow-falls, etc.

6. The cost of securing the necessary way-leaves, and the prevention of unnecessary interference with established rights, also the costs of promoting the bill in Parliament.

7. Value of property at the positions most suitable for the power house and the car sheds.

8. The value of fuel and water delivered at the power house, and the means of disposal of furnace refuse.

9. The use of single or double decked-cars, large or small types of car, and the use or not of trailer cars.

10. Legal expenses, insurance, rates, taxes, interest on borrowed money or capital outlay, and other contingencies.

The working expenses include :—

Car sheds: wages of attendants, materials, etc.

Generating stations: coal, oil, waste, etc., wages.

Management and offices: and engineer's salaries.

Wages of car drivers and conductors.

Depreciation or renewals: interest on capital outlay, legal expenses, insurance, rates, taxes, etc.

A more detailed list of the items of expenditure, would include :—

Power expenses.

Salaries and wages.

Generating station: superintendent, engineers, electricians, stokers, cleaners and greasers, coal and ash attendants.

Sub-stations: attendants and assistants; then there is fuel, oil, waste, gas, water and miscellaneous supplies.

Management and traffic expenses include: salaries,

wages, depot clerks, motormen and conductors, inspectors, trolley and point boys, miscellaneous, etc.

Cleaning cars, wages, and material; ditto for oiling cars, lighting cars, cleaning rails, and salting and sanding the track, fuel power, gas and water for depots.

Uniforms, tickets and general expenses: include, salaries of general offices and staff wages, auditor's fee, rents, taxes, property and income tax, fuel, light and water, fire insurance premiums, legal expenses, accident insurance (third party claims), employer's liability insurance, printing and stationary, and miscellaneous. Under the repairs heading, are wages and material for the permanent way, bonding, ducts, manholes, and cables, overhead, equipment, etc.

Buildings and fittings: power plant and machinery, wages and material, and electric car wages and material.

Bell punches, car accessories, furniture fittings, and miscellaneous.

Permanent way, renewal fund, and depreciation of buildings and fittings; machinery and plant, rolling stock, overhead equipment, rolling stock; also depreciation, maintenance, and renewal fund, for underground conduit system (if adopted); interest on capital, sinking fund, etc.

THE GENERAL MANAGER.

The qualifications desirable for a general manager are: he should be a gentleman of wide commercial experience, should possess good executive ability, be a good organiser, also a master of detail, be able to judge

the capabilities of his staff, have some legal knowledge and should possess the important faculty of combining judgment, tact, and diplomacy, not only in the handling of his staff of officials, and the management of his tramways, but in the more delicate matter of dealing with complaints, accidents, etc.

He should be provided with an efficient staff to assist him to carry out his responsible work, who should be "specialists" in their several departments and be the best men procurable.

One of the secrets of successful management is, in the thorough organisation of the several departments, and the routine of work carried out under his direction. The position and duties of the general manager come under a commercial or financial heading rather than from an engineering standpoint. For this reason his special qualifications must lie in this direction; the engineering and technical knowledge are only of secondary importance although highly desirable.

The general manager's energies, therefore, will be mainly confined to his general office. He must be supplied with regular and periodic returns, and statements of revenue and expenditure of wages, and maintenance work in every department, and details of every item. By such systematic organisation, he can then compare the expenses of each department week by week and year by year, strike an average, and gain a clear insight as to how the proportion of expenses, costs, etc., are borne by each separate department of the undertaking. Having this information at his commands, he

very easily discovers any weakness which may possibly arise from time to time in the various departments, and remedy the cause, if any.

For instance, the wages and general expense and material account of one department may go up considerably for a short period. The periodical statement will show this, and the general manager would naturally investigate the cause of this increased expenditure, with the probable result that it would be found to be due to either renewals, reconstruction, extensions, etc., thereby demanding additional labour and materials, which is a legitimate cause for the increased expenditure. In the general office, it may safely be said, that his right-hand man is a good accountant, whose duties are, of course, to supply him with all these returns and statements.

THE STAFF.

The duty of the accountant is to supply promptly to the general manager the financial results of each week's working in a clear and complete statement of revenue and expenditure.

These figures will include traffic revenue, number of cars, mileage and passengers. The expenditure includes the weekly wages under the heading of working expenses; also salaries.

Then there are items of expenditure for such articles as oil, waste and supplies in general; also, material for cleaning and oiling cars will be charged according to the exact consumption recorded in the weekly returns of

material received from the depots and power station. The items under general expenses will not vary much from week to week, and may be taken as the proportion for the week of the annual amounts.

This method would also be adopted for such charges as licences, depreciation, interest and sinking fund. The premium for third party accident insurance, if chargeable on the basis of the number of cars or mileage, may be put in each week at its exact amount.

For permanent way, the exact costs of repairs, as per a permanent way expenditure form, would be taken, and there would also be charged the weekly proportion of the annual amount set aside to meet renewals.

In this statement, the average per car mile and the percentage of expenditure to receipts would be shown for each amount; and for the items of power expenses, the average per kilo watt hour would be shown in addition.

The corresponding averages for the previous week, and for the last financial year, as per the published report, would be given for comparison.

The surplus each week would be carried forward to the next week's statement, so that every statement would show the balance up to date from the beginning of the financial year.

This weekly statement of receipts and expenditure will show the general manager at a glance exactly how his week's working has turned out, and what its bearing is on the year's results. He will thus be enabled to deal with excesses promptly, and to regulate the service and the expenditure generally.

It is in the up-to-date character of such a statement that its greatest value lies. Long-delayed figures, showing excesses or irregularities which might have been checked, but were not, illustrate to the general manager the importance of timely accounting.

The accountant will, of course, be provided with a staff of competent book-keepers, clerks, etc., who will, at the head general office, keep detailed accounts of all information received from the various departments and branch offices, depots, etc.

An ideal book, dealing in an excellent and exhaustive manner with tramway accounts and book-keeping in all its branches and details, has been written by Donald McColl, Esq., and published by Messrs. Gee and Co., 34 Moorgate Street, London, E.C. For this reason the author does not intend to go into such details as those covered by the above work, and will, therefore, confine his remarks to the broad and general underlying principles which lead to successful management.

In the management and control of the passenger traffic, his right-hand man will be the traffic superintendent. He should be a man well versed in the technicalities of his work, be well used to the handling and control of men, and be able at all times to successfully cope with any increased demands for traffic (which from time to time take place), providing he has the labour and rolling-stock at his disposal.

His most important duty, for which he should possess special qualification and experience, will be to thoroughly organise the passenger traffic; and, in addition, he will be

required to draw up time-tables, allocation sheets, etc., and to engage and organise the staff employed in the operation of the car traffic, subject, of course, to the approval of the general manager; to see that the cars run in strict accordance with the time-tables, and deal with any irregularities in the traffic that may occur from time to time; to take charge of the tickets, bell-punches, parcels system and uniforms; to receive the inspector's reports and complaints respecting the conduct of the men, and deal with all minor cases—the more serious cases to be referred to the general manager—and generally to be responsible to the general manager for the efficient working of the system, whose instructions he shall carry out.

From a practical and financial standpoint, the secret of passenger traffic organisation is to place the cars where the passenger traffic demands it; otherwise, if this object is not attained, the probable result will be that the profit made by the cars running on certain routes will be eaten up by losses incurred in running comparatively empty cars too frequently on other routes—due, of course, to defective organisation.

It is obvious, that to run so large a service as to bring the receipts per mile below the average required to pay all working expenses and fixed charges, and to provide for depreciation and reserve, would be unwarrantable.

The demands for very close services, and for lines to outlying places, are apt to tend in this direction if each route is not closely watched, and the service, as far as possible, suited to the traffic.

To increase the frequency of any service, it is, of course, necessary to put more cars upon the lines, and it is very convenient to be able to make a rapid calculation as to how many cars would be required for any given service, and upon any section.

The following simple formula is applicable in any case :—

$$\text{Number of cars required} = \frac{60 \times L}{S \times M}.$$

Where L = Length of double journey in miles.
S = Minutes apart of cars, or service.
M = Average speed of cars in miles per hour.

Fixed stopping-places should be fairly easy to arrange on any tramway route, and may be of two kinds, viz. (1) places at which all cars would stop, and (2) places at which cars would only stop if required.

The former would of course be at prominent street junctions averaging say 220 yards apart, and the latter at intermediate points, not less than 100 yards apart.

To the tramway management fixed stopping-places are an absolute necessity, if schedule time is to be maintained, and if the consumption of electrical energy and the wear and tear and undue strains of the cars are to be kept at a minimum.

Once properly understood by the public, there is no difficulty whatever in working the system, as intending passengers will naturally walk to, and wait at, the nearest stopping-place, instead of standing anywhere along the street.

A possible objection to the system of fixed stopping-

places is, that intending passengers might often miss a car, through not having arrived at a stopping-place until the car had just started off. But a fundamental rule (where there is a big passenger traffic) for any successful electric or other tramway is, that a frequent service must be maintained; so frequent, in fact, that published time-tables are quite unnecessary, the public knowing that if they miss one car they will be able to take another in a very few minutes. Generally (under suitable conditions), a rapid and frequent service will create its own traffic, and will often make a previously unsuccessful line pay.

If the system carries parcels and merchandise, the general manager's right-hand man for this branch of the business will be a competent goods traffic superintendent. Generally speaking, his duties will be more complicated and arduous than the passenger traffic superintendent. His position will generally be the most difficult to fill, demanding as it does special experience in an extensive, varied and versatile list of duties as regards goods traffic organisation in all its details; including handling of goods (rapid and careful), classification of goods, traffic rates, Board of Trade regulations under several headings, special knowledge as regards interchange of traffic and working in combination with other vested interests and railroad systems, etc.

This is the one branch of the undertaking where legal difficulties are apt to arise from time to time, with the ultimate result of expensive law suits, litigation, etc. Some of the problems which have to be dealt with under this branch are set forth in a future section (II).

The car-shed superintendent should not only be a good practical man, but be well versed technically in the construction and testing of motors, controllers and all accessories on the car, and thoroughly understand the rolling stock in general.

There should also be an overhead wire and construction superintendent, to thoroughly inspect and maintain in good efficient order all wires, etc., and be able to competently superintend any extensions which may be required.

The permanent way should be under the control of a thoroughly experienced and practical permanent way engineer, who will have a competent staff under him, and the permanent way must be periodically inspected, more especially at joints, crossings, turnouts and switches, frogs, etc.

The automatic tongues and tongue boxes should be kept clean, well greased and working freely; rail joints should be often inspected to see that they are not vibrating loose; it is highly important that the rail grooves should be kept as clean and free from gravel, sand, stones and mud as possible. It must not be forgotten that the tractive force or resistance to traction is kept low by such means, which of course means less power consumed in working the car.

The track should be periodically gauged to see that it keeps true. By such inspection, etc., the life of the permanent way and car wheels is increased, the power consumed kept at its lowest, and the maintenance expenses low.

The rolling stock should be periodically overhauled, inspected, cleaned and greased (where required); the brushes and the sliding contacts on the controller barrel should be kept clean, and good metallic clean contact at even pressure be maintained between the brushes and contacts.

The motor bearings and gearing should be well lubricated, and the armature commutator kept smooth and clean and the brushes nicely adjusted, and suspension mechanism kept in good order; all cable and wire connections should be in good contact (both electrically and mechanically).

Loose connections cause faults and undue heating. The sand boxes and sanding pipes should be kept dry and clean, the hand brakes and pull rods and chains should work freely, and the bearings should be well greased, and the emergency brake be in good order. The same remarks apply to the electrical appliances, etc., such as trolley pole and wheel, circuit breaker, lightning arresters, fuse blocks, switches, lamps, etc.

With such systematic inspection, etc., the life of the car and its equipment is increased, and the cost of maintenance is kept at a minimum.

The overhead equipment should also be periodically inspected, the poles should be kept well painted as this prevents rusting; every ear should be examined to see if the wire is worn at the lip, and that the insulating bolt is in good order. Span wires, guard wires, flexible suspensions and nozzles, should be examined for broken strands and rust.

All nozzles, turnbuckles, mechanical frogs and their pull-gear, should be kept well-greased. Cracks should be looked for in globe strains and other insulators. Section insulators should be examined for wear, and feeder cables should not have worked loose at the section insulators, or have the insulation worn off at the point where they come through the pole.

The fact must not be lost sight of, that a certain percentage of the revenue receipts is required for maintenance expenses, and the great object should be to keep this expense to the lowest possible limit. This can only be attained: first, by installing a good sound equipment from beginning to end; and second, by employing competent officials, who give the different sections of the system a thorough systematic inspection and overhauling—this avoids accidents from neglect, due to defective unsafe apparatus, and keeps the equipment in smooth and efficient working order.

The chief duty of the ticket inspector is to inspect tickets and way bills, and generally to see that the conductor performs his duties satisfactorily, and make his reports accordingly; he is directly responsible to the traffic superintendent for the proper performance of the duties.

The chief duty of the motor inspector, is to inspect and see that the motors are in good and efficient working order; also that the controllers, wire cables, circuit breakers, fuses, lightning arresters, signalling bell, lamps, etc., are in good order. He is directly responsible to the car-shed or rolling-stock superintendent for the proper performance of his duties.

The traffic regulators regulate the running of the cars, according to the time table.

We now come to the man who carries human lives in his hands; viz., the motor-man. Considered from this point of view, he is the most responsible man in the service; it is therefore, a matter of the gravest importance, that he should be fit and proper in every particular to undertake the piloting of humanity safely from place to place.

There is controlled and kept in check, by the simple controller handle, practically an unlimited amount of electrical energy, which if once out of control (due to incompetency or other cause) would probably hurl into eternity dozens of lives.

We require a human machine to efficiently work the controller handle and brakes. This human machine is the "motor-man."

He should possess all round qualifications applicable to the position he holds.

The thing which must be insisted upon, before placing lives in his hands, is physical fitness; he must have good eyesight, be in good health, good senses in perfect working order, general intelligence, physically perfect, cool and collected, quick to act in cases of emergency, and thoroughly understand the responsibility of the position he holds.

After this, comes the thorough instruction in regard to the efficient and smooth working and running of the car, more especially when starting and stopping; this should be done gradually, which prevents undue strain

on the motors and the cars themselves, also the unpleasant jolting of the passengers.

A thoroughly competent "instructor" should be engaged for this special duty (the instruction of motor-men). This instructor should be well versed technically and practically in all and every detail appertaining to his business.

No man, under any circumstances, should be put in charge of a car unless he possesses the above qualifications.

Motor-men should be subject to periodical physical examination; if there is a "weak" spot in any of the above qualifications, then the safety of the lives entrusted to his care are always jeopardised.

The best "hint" that the author can offer to "managers" of electric systems is, to keep your eye on the "motor-man." A good idea, well worthy of careful consideration, is for companies and corporations to offer a Christmas or New Year's bonus for all "motor-men" in their employ, who from year to year perform their duties satisfactorily, without accidents of any kind due to their fault. If such were the case there would not be seen so many cars with the fronts or backs dinged in, bent, etc., and motor-men would be less risky and not cut things so fine as they sometimes do, thus tending to prevent accidents more or less serious.

A suggested "bonus system" would be to give such "motor-men" double pay at Christmas or New Year; it is a much "wiser" and "commercially benefic al" policy to distribute a few hundred pounds in this way,

than run the risk of paying several thousands of pounds in "legal expenses," damages for accidents, etc.

The duties of the conductor is chiefly to collect fares, start and stop the cars, be civil to passengers, etc.; a bonus might also be offered to all conductors from year to year who perform their duties satisfactorily and who are free from complaints made against them. Each conductor and motor-man must be provided with a book of instructions as regards their duties, and it is needless to say that every man in the service should be provided with a copy of "rules and regulations."

By the adoption of such tangible common-sense methods, you will get better service in every way from the men, which will amply repay itself in various ways, including less anxiety and worry to the general manager.

For the benefit of those who are ignorant of the fact, it may be said, that some steamship companies pay yearly bonuses to captains and engineers who take their vessels safely without accidents during the year. They consider it greatly to their advantage to practise this system.

A valuable feature in the working of any large undertaking similar to electric tramways, light railways, etc., is the holding of conferences (say once a month), whereby all the head officials in the several branches, have the opportunity of meeting one another and the general manager, comparing notes, exchanging experiences, and discussing, for everyone's mutual benefit, various problems and suggested improvements that might have a direct bearing on one or more of the

several branches of the undertaking; also in order to seek personal advice and instructions on important matters.

The chief officers themselves derive benefit from being brought in contact with the men who are engaged from day to day in the actual working of the traffic, and are kept well posted in everything that is going on all over the system.

Choice of Cars.

A word or so here will not be out of place regarding the size and types of tramcars to be adopted, from a commercial point of view.

The correct type of car must to a great extent depend upon the kind of service for which it is to be used. As regards this choice of cars there are different opinions, and is a matter which demands careful and serious consideration, for, by a proper choice of cars, many thousands of pounds may sometimes be saved in the case of extensive undertakings.

Some tramway engineers and managers are in favour of the small type, and others are in favour of the large type of cars. Neither type, taken separately, fulfils the ideal under average local conditions; generally a combination of the large and small type is more economical.

For example, supposing we take seaside resorts. In winter, when the traffic is comparatively small, then the small type of car is more economical, because they require less power to drive them. In summer, the large

type of car is the more economical, because they carry the most passengers. The fact must not be lost sight of that, whereas the large type of cars requires more power to drive them than the small ones, still at the same time the labour cost of running them, i.e. the motor-man and the conductor is exactly the same. Under some special conditions however, in the case of very large cars at busy times, there is sometimes a boy in addition to assist the conductor in his duties.

Large cars have an additional advantage in the fact that they are more efficient than small ones when fully loaded : i.e. the large cars carry their full complement of passengers with less proportionate expenditure of power than the smaller ones when they are fully loaded.

Therefore, in winter it would be false economy, under the above conditions, to run large cars comparatively empty of passengers, since there would be an excess of energy used for no useful purpose ; and in summer it would be false economy to run a very quick service of small cars to cope with the large passenger traffic, because by so doing you have a big capital outlay on a large number of small cars, comparatively increased labour expenses, and increased depreciation and maintenance expenses ; whereas the large type of car would meet the demand.

Again, in large manufacturing or business centres, generally, a combination of the large and small type of cars is the most economical, for the very obvious reason that at certain hours of the day, viz. at morning, noon and evening, there is generally a large passenger traffic

which has to be met by having the large cars; again, during certain other hours of the day the passenger traffic is comparatively small, and then the small cars are the most economical.

Under such conditions as the above, a good combination would be to have 1 in 3, or 1 in 4, a large type of car.

To state the proposition in a few words, there are the hours of heavy traffic demands, suitable for the large cars, and the hours of light traffic demands, suitable for the smaller cars—assuming, of course, that the time service of the cars is the same in each case.

The question then resolves itself into what is the most economical method to follow, to attain the maximum revenue returns with minimum capital outlay and expenditure; because this question affects the whole question of the power station design, size of feeders, number, size and cost of cars, extent of the staff, maintenance, labour, etc.

The answer to this is to judge the local conditions, obtain some reliable data of the probable passenger traffic (from generally already existing conditions), and the probable increase; and from these data to so proportion the combination of the number of each type of car, large, and small, that with the agreed-upon time service you can carry the full complement of passengers at all hours of the day, with the minimum outlay of capital, labour, consumption of power and maintenance expenses. The nature of the gradients of a track as regards the length, number and steepness, also affects the question of choice of cars.

Single- and Double-Deck Cars.

In every country, excepting England, the use of single-deck cars is practically universal, and those who have had the most experience in electric traction work, are almost unanimous in their preference for them.

The advantages that the single-deck car possesses over the double-deck car, are, (1) the much shorter space of time in which the car can be emptied and filled; (2) the greater ease with which the conductor can collect the fares, as he has no stairway to climb; (3) the greater height which can be allowed in the interior of the car; (4) consequently ventilation is more easily attained; (5) having no stairway, they eliminate the danger of accidents to passengers occurring from this cause, due to falling, etc.; (6) the much lighter construction which can be employed in the roof.

The single-deck car has, of course, to be longer than the double-deck car to accommodate the same number of passengers.

In England (at the present time) the double-deck car is almost universally used, and when the weather is either rainy, windy or cold as in winter, it becomes necessary to afford some kind of protection to the top-deck. To overcome these difficulties there are various patent dry seat arrangements, more or less successful for rainy weather, and for cold and wintry weather, top covers are provided; in the majority of cases consisting of total enclosing in, by means of a framework and glass. In the author's opinion, all of these arrangements are

a needless expense (of from 25*l.* to 50*l.* per car) to try and improve (what was in the beginning) a "bad job" due to want of judgment in the type of car adopted.

In America, single-deck cars are made in two types, one an open car, and the other a closed one. The former is used entirely for summer traffic, and is made up in two types. One type is where there are rows of seats built on the car body, without any roof or cover over them, and somewhat resemble a toast-rack. The other type is entirely open at the sides, front and back, with a roof over; it is also provided at the sides, front and back with blinds, which, when the weather is fine, roll up out of the way and leave it an open car; but if the weather should turn out very windy or rainy, the curtains can instantly be let down, completely covering in the car, protecting the passengers, and is to all intents and purposes a closed car temporarily.

This type of car is more in favour than the "toast-rack" type of open car, for the reason just explained.

A very good type of car which has recently come into favour is a "combination" open and closed single-deck car. This car has a closed body in the central portion and open seats at each end. The open seats are a great convenience for those who like fresh air rides, also for smokers; the open seats can be closed to a large extent by means of blinds, as previously described, which serve both as a protection from the sun, and also from the rain and wind.

This "combination car possesses the advantages of both the single and double-deck cars, without their dis-

advantages, and has a seating capacity equal to that of an average size double-deck car.

Of course it can be made in various sizes.

The author believes that this car approaches the ideal, and in the future will be greatly adopted. He highly recommends it for favourable consideration by the traction world ; in his opinion such single deck cars run much "smoother" and ride "easier" than double deck cars.

Ordinary and Reversed Types of Stairways.

Double-deck cars require a staircase at each end, to give access to the top of the car. The disadvantage of the "ordinary" type of stairway is that the passenger may easily be thrown into the road if the car should start suddenly while he is ascending or descending.

The "reversed type" of stairway has recently come into great favour, the advantages of this type are : (1) it affords protection to the passenger, and (2) allows the car roof to be extended right over the platforms, thus giving additional top seating accommodation, but the advantage here gained introduces a disadvantage which is an element of danger.

When a car goes round a curve there is always a swinging motion, which is felt least in the middle and most at the two ends ; this swinging motion causes internal stress and strains in the car body and truck, and the wrench on the bolts which fasten the body of the car to the truck is very great in going round a curve. Now, the greater the distance of the ends from the middle, also

the more the ends are loaded, the greater does the "radius of gyration" become, and the greater are the consequent strains in going round a curve; for this reason, the strains in a reversed type of stairway are much greater than in the ordinary type, because the ends are further away from the middle, consequently this type of car has to be more substantially constructed than would otherwise be necessary, or else the life of the car is seriously affected.

By the adoption of single-deck cars, the above considerations are eliminated.

Single and Bogie Trucks for Tramcars.

The first point to consider in the choice of a car is the type and dimensions of truck to adopt, and then the car body must be adapted to suit the truck.

The special features of the track which have to be noticed before selecting the truck are as follows:

1. The nature of the gradients.
2. The radii of the curves and turnouts.
3. Whether or not the curves occur on gradients or on the level.

While the smooth running of tramcars depends to a very large extent upon a proper road bed, yet the type of truck used has a good deal to do with the matter. The greater length and heavier weight of an electric car combined with the higher speed at which it travels, make a choice of truck a very important matter.

Trucks are usually divided into two classes (1) single

trucks, having four wheels, and (2) double trucks, having eight wheels.

If there happen to be no curves of small radius, and no gradients worse than 1 in 20, almost any type of truck will prove satisfactory.

For cars up to about 30 feet in length over all, a four-wheel truck with rigid wheel base is generally adopted, but for cars of a greater length, double or bogie trucks are essential, provided with flexible wheel bases in order that the car may travel easily round curves.

If the curves along the track fall much below 50 feet radius, single-truck cars will be found to cause great trouble, and wear between the wheel flanges and the rails, and are therefore inadmissible.

If the track contains many gradients of over 1 in 20, single or double-deck single-truck cars are preferable. In this case it becomes necessary to drive every axle of the truck, and if bogie-truck cars are employed the consequent four-motor equipment makes the ratio of the working expenses to the number of passengers greater than if single-truck cars are used.

On account of the fact that each axle must be driven on lines where steep gradients occur, if large bogie cars are necessary to cope with rushes of traffic, equal-wheel bogies must be adopted, otherwise the wheels will slip or skid.

To overcome the difficulty of sharp curves, where large cars must be used, bogie trucks are necessary. Each truck, with its four wheels, is so mounted that it can swivel under the car, and accommodate itself to the

track without strain to the car body, as it passes round the curves.

But the use of bogie trucks involves several disadvantages. As two motors only are generally employed on a car, and as each motor is suspended on one of the axles, it is not possible to drive by all four axles, and so there is a great tendency for the driving wheels to slip, since a large portion of the weight of the car is carried upon the trailing axles.

A type of bogie, called a "maximum traction truck," has been introduced to overcome this difficulty. Instead of having four equal wheels, with the car supported over the centre of the truck, it has two driving wheels, usually of 30 inches diameter, and two smaller wheels, called "pony" wheels, usually of 22 inches diameter.

The car is carried from a point nearly over the axle of the driving wheels, with the result that as much as 80 per cent. of the weight of the car can be utilised in obtaining adhesion to the rails.

The "pony" wheels simply act as guiders, and, as they carry only a small proportion of the weight of the car, they are rather apt to rise out of the rail grooves, when the truck is taking a curve.

The "maximum traction truck" is quite satisfactory for speeds up to about 12 miles an hour, and for routes not having gradients of more than 1 in 20.

If higher speeds are required, or heavier gradients occur, then single-truck or equal-wheel bogie cars become necessary, because, for a given weight on the driving wheels, only a certain useful maximum turning couple

can be reached, limited by the friction between the driving wheels and the rails.

If this couple is exceeded, the only result is to skid the wheels.

In the "maximum traction truck" only part of the weight of the car is on the driving wheels, hence the maximum frictional couple is less than if each axle were driven.

There are means provided on "maximum traction trucks," whereby the proportion of the weight on the driving wheels may be varied. There is, however, a limit to the proportion of the weight which may be put on the "driving" wheels caused by the tendency of the "pony" wheels to leave the rails; also on heavy grades, the driving wheels are very likely to slip, since the whole weight of the car cannot be carried upon them.

Rapid acceleration is not possible with "maximum traction trucks," for the latter reason, and their use thus deprives a car of one of its most essential features.

These difficulties can be practically removed by using bogie-trucks with four equal wheels, and with two motors per truck. By these means all the wheels become drivers, they are not liable to slip, and, as the weight is equally divided, there is no more risk of derailment than with the ordinary four-wheel car.

But the adoption of four motors per car increases the cost of equipment, and the liability of breakdowns, since there are four motors to go wrong instead of two. The use of four motors in this way does not necessitate a four-motor controller. The two motors, on either truck,

are coupled together electrically, and are treated as one motor by the controller.

The whole question of the correct type of truck is not yet settled, but for ordinary traffic a moderately short car, with a four-wheel single truck and two motors, will be found to give the best all-round results. Details regarding the practical limits of car-truck wheel bases, radius of curves, gradients, and other points in tramway construction, are given in the author's book, 'Practical Construction of Electric Tramways' (Spon).

SINKING FUND, DEPRECIATION RENEWAL AND RESERVE FUNDS.

I. Sinking Fund.

Acts of Parliament, conferring powers on corporations or other bodies to construct and equip tramways, and to borrow money to a specified amount for this purpose, always provide for the repayment of such loans.

This repayment is effected by means of a sinking fund, which consists of a percentage per annum on the amount borrowed, taken out of the annual revenue, this percentage being fixed according to the period in which the debt is to be wiped out.

The sinking fund is generally accumulated at interest.

Two per cent. sinking fund, accumulated at 2½ per cent. interest, will wipe out a debt in thirty-three years; if accumulated at 3 per cent., the debt will be redeemed in thirty-one years.

A simple illustration of the purpose of the sinking fund

may be given. A man borrows 1,000*l.* to start a business, and desires to pay off the debt in say twenty years. By calculation, he ascertains that a sinking fund of 3*l.* 14*s.* 5*d.* per cent., accumulated at 3 per cent. interest, will accomplish this. By this means, at the end of the twentieth year, the 1,000*l.* borrowed will be paid off, and the man's own 1,000*l.*, not another's, will be invested in his business.

In cases where power to borrow has been obtained under different Acts, and capital has been borrowed in different years, it is desirable to sub-divide sinking fund according to the year of borrowing. Thus, money borrowed say in 1895 will be wiped out in 1926, by a sinking fund of 2 per cent. accumulated at 3 per cent.; and money borrowed in 1900 will be wiped out in 1931 by the same percentages. Consequently, after 1926, no further sinking fund need be set aside on the amount borrowed in 1895. (An excellent statement, showing the application of sinking fund to amounts borrowed in different years, is given in McColl's work on 'Tramway Accounts,' etc.)

The portion of such a statement as this, which relates to the current year, might always be embodied in the published financial report of the undertaking.

There is apt to be, and there is, so much misconception regarding the real purpose and limits of sinking fund, that it is well to emphasise the fact that it is merely a method of repaying borrowed capital, in order that, ultimately, if there is no additional borrowing, the undertaking would be a free asset, unburdened by any charges for interest or redemption of debt.

II. Depreciation and Permanent Way Renewal Fund.

While sinking fund deals with money borrowed, depreciation deals with the tangible items of capital on which the money has been expended.

It is not sufficient merely to pay off loans, provision must be made to renew the various items of capital as they become worn out. For this purpose, there must be set aside from the revenue sufficient sums, in name of depreciation, to meet renewals when they become due.

The amount set aside as depreciation may be separately invested, or it may have been expended for capital purposes to avoid borrowing. In the latter case, the amount may still be borrowed. In both cases—and this is the essential requirement—there are funds available to meet the required renewals.

By charging against revenue fixed annual percentages of the original cost of the various items of capital, an equalisation of renewal charges over the years is secured. Otherwise, unduly heavy charges would fall on some years and unduly light charges on others.

The life of the subject determines the rate of depreciation. If it is known that a subject will be utterly valueless in say twenty years—without even a scrap value—then depreciation at the rate of 5 per cent. per annum should be written off.

If it is reasonably expected that a subject will have a residual or realisable value of 20 per cent. of its cost when it requires renewal in twenty years, then 4 per cent.

per annum should be written off as depreciation. When a renewal is carried out the full cost would again appear in capital account, and the process of reduction by depreciation would recommence.

It must be clearly understood that depreciation should properly be provision for renewals only, corresponding to the shrinkage in value of the assets, and that ordinary repairs executed must, in addition, be charged year by year against revenue.

It should also be noted that provision for capital becoming obsolete through improvements, or change of system, should not, strictly speaking, be included in depreciation charges against revenue. Such provision should, preferably, be made by a reserve fund, as explained under that heading.

The various items of capital must be treated separately according to their special circumstances.

The following information and details are taken from McColl's 'Tramway Accounts Book,' and are based upon the workings of the Glasgow Corporation Tramways.

Permanent Way.—As large sections of track often require renewal at one time, and as the life of different sections will vary according to the traffic, a renewal fund will be found more serviceable for dealing with this item than the ordinary method of writing down the capital cost by depreciation.

An average life must, of course, be estimated in fixing the amount per mile of track to be charged annually against revenue for track renewals. The

service to be got out of a line, is, of course, dependent upon its construction and gradients, and upon the number, weight and speed of the cars and other vehicles passing over it.

Local circumstances must always be taken into account. The life of an electric line will certainly be appreciably shorter than that of a horse line, and, in charging for renewals, it will be sounder finance to under-estimate than to over-estimate this life.

In a city with a close electric car service, and a good deal of other vehicular traffic, 450*l.* per mile of single track is estimated as necessary to provide for renewals. This is on a basis of an average life of from ten to twelve years.

The unexpended amounts charged to revenue account for future renewals would be credited to a specific account, Permanent Way Renewal Fund, which would appear as a liability in the balance sheet, and to which would be debited the cost of all renewals when executed.

Permanent Way Electrical Equipment.

(*a*) *Rail bonding.* — The copper bonds with which the rails are jointed will require to be taken out when the rails are renewed. It is considered advisable to renew the bonds along with the rails, consequently provision for renewal of bonding might suitably be made at the same rate as for the track, or after allowing for scrap copper say 7½ per cent.

(*b*) *Ducts and Manholes.*—The iron ducts or pipes,

through which the cables are drawn, are embedded in concrete, which forms a new channel for the cable. In the ordinary course the duct does not require to be renewed. Strictly speaking, therefore, depreciation is unnecessary. The reserve fund should provide for wiping out the cost on a change being made to another system. If this is not done however, depreciation at, say 2½ per cent. might be written off.

(*c*) *Feeder Cables.*—A very long life may safely be predicted for cables, although, of course, they have nowhere been long enough in use for even experts to state a definite period. On the basis of a thirty to thirty-five years' service a depreciation of 3 per cent. would be ample. This life is estimated for cables conveying current for a fairly close service.

(*d*) *Poles and Rosettes.*—Excepting accidents, internal corrosion is the only element of wear in connection with poles. An average service of thirty years may be safely taken, requiring a depreciation of 3 per cent.

(*e*) *Overhead Wires.*—Unlike many other items, the overhead trolley wires will be continually undergoing renewal, the cost of which would, year by year, be charged to revenue. Curves at busy crossings may last only six months ; on routes where a close service is run, two or three years' life is all that can be depended upon. The work of renewal might be so systematically arranged that by charging against revenue the actual expenditure year by year an equalisation of charges over the years would be secured, and depreciation would be unnecessary.

(*f*) *Section Boxes.*—As from twenty to thirty years' life may fairly be taken for section boxes, depreciation at from 4 to 5 per cent. per annum would be ample provision.

Ground.—As the value of ground will not, as a rule, depreciate, any provision under this heading will be unnecessary. Should it appreciate, no addition to the capital account would be made under this heading.

Buildings.—For tramway buildings, which are principally of brick, and which deteriorate very slowly, a depreciation of 2½ per cent. per annum should be sufficient.

Machinery and Plant Works.—The works machinery, consisting principally of iron-working and wood-working machines, which will be in constant use, is bound to deteriorate quicker than many other items of capital. On the basis of from twelve to fifteen years' life, depreciation at 7½ per cent. per annum should be provided.

Power Station and Sub-stations.—As spare generating plant requires to be provided, such plant will always be idle and will suffer little wear and tear. For the electrical plant at the power station and sub-stations, a fairly long life may be safely anticipated. A rate of 5 per cent. per annum over all for depreciation should be ample provision for all renewals.

Rolling Stock.—To place the life of an electric car at anything beyond twelve or fifteen years, if it runs at a fair speed and the traffic is moderately heavy, would most likely be to form too sanguine an estimate. At that rate, 7½ per cent. per annum should be written off as depreciation. If, after some years' service, that allowance

is found to be insufficient, the rate would naturally require to be increased, just as it might be reduced in the unlikely event of the life exceeding the estimate. This principle would, of course, also apply to the depreciation of other items of capital.

Sundry Equipments.—These, consisting principally of car accessories, will, like the overhead equipment, be undergoing regular renewal, the cost of which would be charged against revenue, thus obviating the necessity for depreciation.

(NOTE.—In some of the above estimates *re* depreciation, Mr. McColl makes no reference as regards the scrap or realisable value of some of the stock, plant, etc. Assuming that his estimated depreciation does not take this item into account, then there must certainly be an allowance made for such stock, etc., which will realise a proportion of their cost. Take, for instance, scrap copper in feeder-cables, generating plant, machinery and rolling stock. They may have a realisable value of say from 10 to 25 per cent. of their original cost, thus reducing the depreciation estimate in that proportion.—AUTHOR.)

Furniture.—A nominal depreciation of 2½ per cent. might be written off furniture until the realisable value is reached.

Horses and Harness.—These should be written down by depreciation to their realisable value at the rate of say 7½ per cent. per annum, and fully maintained out of revenue.

Uniforms.—As an equipment of uniforms will probably last two years, a simple method would be to reduce

the capital account by depreciation to one-half of the original cost and keep it permanently at that. Instead of charging to revenue the full cost of the new equipment purchased every alternate year, only one-half would be charged, the other half being carried forward in suspense to be debited the following year, thus securing an equalisation of charges.

General.—Depreciation at fixed percentages should undoubtedly be written off every year, according to a pre-arranged scheme such as the foregoing. The plea of insufficient surplus should never be allowed to excuse failure to make this necessary charge against revenue.

A deficit should rather be shown, and carried forward to the following year. In no other way can the accounts exhibit, as they should, the true results and position of the undertaking.

Depreciation should always be deducted from the various items in the capital account, and should not appear as a fund on the liabilities side of the balance-sheet. To revenue account would be charged the full cost of the repairs, as well as the depreciation required to provide for renewals.

Under the system sometimes advocated by which depreciation to meet renewals is held to be partly provided for by sinking fund, money would require to be borrowed for renewals to the extent to which sinking fund had been held to provide for depreciation ; and the municipal ideal of an undertaking free of debt, and consequently free of interest and sinking fund charges, would never be even approximately realised.

It seems a reasonable view, considering the rapid advancement in all branches of science and invention, that the repayment of debt, and also provision for the replacement of those assets on which the amount borrowed has been expended, should go on simultaneously.

It is better, if any error is to be made, that it should be on the side of safety; and in any case it is clear that large systems of electric tramways can be operated at extremely low fares, and yet be able both to repay their debt and provide fully for renewals.

III. Reserve Fund.

No system of traction can be considered permanent. The most up-to-date mechanical and electrical arrangements, may, sooner or later, be superseded. Competitive science, striving to combine the maximum of efficiency with the minimum of cost, may be relied upon to keep the scrap-heap well supplied. Alterations, also, which, strictly speaking, add nothing to the value of the plant, could not be charged to capital, and it would be misleading to include them in maintenance charges against revenue.

For such contingencies as this, a reserve fund might be accumulated. There can be little doubt that it is expedient for a corporation department to carry to reserve fund the entire net surplus, after paying all working expenses and fixed charges. The object of a municipal tramway undertaking being to provide the best possible travelling facilities, at the lowest possible

fares, there should not, of course, be an unduly large surplus available after paying fixed charges.

The reserve fund may, of course, like depreciation, be either invested or in the form of unborrowed capital, and should be always available.

The question as to the disposal of the surplus of profitable municipal undertakings is sometimes solved by appropriating it in relief of the rates. This is even attempted without debiting the undertaking with sufficient charges for depreciation, etc.

In the tendency to unduly magnify the undoubted financial and other advantages of municipal as compared with private operation, there lurks the danger of neglecting to make proper provision for the future.

Even, however, after such provision has been made, the expediency of relieving the rates with any remaining surplus is questionable. By far the most logical and equitable arrangement is, to give the benefit of any surplus to those from whom it is directly derived—the passengers. Reduced fares, a better service, extensions to outlying districts—in such ways, the undertaking may be made an invaluable social factor, and yield only such a surplus as the future contingencies of the system demands ; and these contingencies should rather be over-estimated than under-estimated.

The fact that electric traction working expenses (excluding depreciation) average only about 6*d.* per car mile, as compared with about 9*d.* for horse traction, is apt to encourage an idea that the net free surplus from the former is much greater than it really is.

It must be borne in mind that the capital with electric traction is considerably greater *pro ratâ* to the receipts than with the older system, and that consequently fixed charges are much heavier. The following shows, approximately, the results which should generally be looked for with electric traction in populous towns, on the basis of fares fixed as closely as possible to working costs :—

	Per Car Mile.	
	d.	*d.*
Receipts		10·50
Working expenses		
Power	·35	
Traffic	3·15	
General	1·00	
Repairs	1·00	
Depreciation and provision for permanent way renewals	2·20	
		7·70
Gross balance		2·80
Deduct :—		
Interest and sinking fund		1·80
Balance available for reserve		1·00

It is obvious that to run so large a service as to bring the receipts per mile below the average required to pay all working expenses and fixed charges, and to provide for depreciation and reserve, would be unwarrantable.

The demands for very close services, and for lines to outlying places, are apt to tend in this direction, if each route is not closely watched and the service as far as possible suited to the traffic.

Attempted comparisons of the results of municipal with private undertakings are sometimes misleading.

There should, however, be no dubiety as to the actual net surplus.

Depreciation should be the same with both a limited company and a municipal undertaking. But a company having no interest or sinking fund to pay, these, added to the net surplus, should constitute the municipal equivalent to the company's profit distributable as dividend or set aside as reserve.

A reserve fund, accumulated for a specific purpose, can only be used for that purpose. If a reserve fund is intended for general purposes, and to meet any contingency, it should be unspecified.

END OF SECTION I.

SECTION II.

Possibilities of Light Railways—Goods Traffic—Carriage of Merchandise on Electric Tramways—Terminal Charges—Economic Considerations—Competition and Combination—Clearing House System, etc.

THE following excellent article * on the subject of 'Light Railways and Land Development,' is inserted by kind permission of Messrs. J. M. Hewitt and W. G. Rhodes, D.Sc. M.I.E.E., consulting engineers, Manchester.

The keen and ever-increasing competition, both in home and foreign markets, from which the industries of this country are suffering, has of late been repeatedly impressed upon us, and the interest taken by the general public in the matter is shown by the fact that almost every daily paper contains some reference to the subject. This competition, however, has not been an unmixed evil, as our manufacturers have profited by the lessons taught them, and are now endeavouring, not unsuccessfully, to make up lost ground by adopting modern methods and modern machinery.

Difficult as success has been, and doubtless will be,

* From the *Electrical Review* of May 16th and 23rd, 1902.

where our industries are concerned, there are still greater difficulties to be overcome before the agriculture of this country can be placed on a satisfactory basis, and worked on profitable lines; our competitors are spread over a large area; they are closer to our doors, and are equipped with a means of transport which enables them to place their products on our markets at a smaller cost than we ourselves can do.

Much has been said and written in a pessimistic vein regarding our position in the manufacturing world, but it would be difficult to be optimistic with regard to the position of our agriculturists while the land of this country is gradually going out of cultivation, and the agricultural population, which should be the backbone of the nation, is steadily migrating to the towns, where it rapidly deteriorates, mentally, morally and physically.

If any remedy for this state of affairs can be found, which will have the effect of migration from town to country, the whole population, industrial and agricultural alike, will benefit enormously; any such improvements must, however, be preceded by a complete change in our methods, and by a more enterprising spirit on the part of our landowners and farmers, who should follow the example of our manufacturers by adopting the points in foreign systems which are superior to their own.

The cost of railway carriage in this country for agricultural produce is one of our chief difficulties in successfully competing with foreign rivals, and, although the Light Railway Act of 1896 was passed with the

intention of giving facilities for the transport of the products of the land to a ready market, the Act has been more used for the purpose of promoting light railways in populous districts for the sake of passenger traffic.

The proper field for the exploitation of light railways has been almost entirely neglected, and, as a consequence, neither our agriculture nor our fisheries have benefited by the Act as was intended.

It has been imagined that it is only possible to make light railways pay in populous districts, notwithstanding the fact that railways of this kind on the Continent not only earn fair dividends, but also have promoted the interests of agriculture and trade, and increased the value of the land adjoining them.

Being interested in a railway to be constructed in this country, where the goods traffic is likely to exceed the passenger traffic, and where the conditions resemble those prevalent on the Continent, we desired to make ourselves thoroughly conversant with the methods adopted in Belgium, where there is a very complete network of light railways. We, therefore, asked M. C. De Burlet to grant us permission to examine the light lines constructed by the Belgian National Light Railway Company, of which he is the managing director. This permission was most cordially given, and he was good enough to depute M. Paul Berger, one of his engineers, to accompany us over portions of their light railways.

The information which we have obtained is of the greatest value in furnishing illustrations of commercially

successful light lines running through sparsely populated districts, and depending for traffic chiefly upon agricultural products and manufactured goods, and it is of national importance to realise that similar methods of dealing with the natural wealth of the land should be adopted in our own country.

There are at present in Belgium, which is only half as large again as Wales, 1234 miles of light railways already in operation, 416 miles in course of construction, which are laid at the rate of about 100 miles per annum and an additional 1320 miles to be constructed. When this mileage is completed, there will be 1 mile of light railway to every 3·84 square miles of land.

In Belgium, the lines are usually single lines with turnouts, with varying gauges, the cost per mile, including rolling stock, varying from 1300*l.* to 9000*l.* Sidings are taken into farmyards and factories, the latter often manufacturing chemical manures which the farmers on the route can receive direct from the manufacturer at the small cost for carriage of 1½*d.* per ton per mile.

Agricultural produce varies in cost of carriage according as it is conveyed in closed or open wagons, the cost per ton per mile being 2·32*d.* when closed wagons are used, and 1·7*d.*, or less, where the goods can be transported in open wagons, with an addition in each case of 4·9*d.* per ton whatever the distance carried.

Passenger fares are equally low, first-class fares being about 1¼*d.* per mile, and second-class fares about $\frac{9}{10}d.$ per mile, while weekly tickets are issued to labourers and school children at half the usual rates.

The travelling facilities given by the light railways have increased the traffic between village and town or village and village; for instance, the passenger receipts on the Antwerp-Hoogstraeten-Turnhout line — which were in 1887, the first year of working, 8893*l.*—were, in the year 1901, 12,365*l.*, an increase of 40 per cent. after a period of fourteen years. The receipts from goods traffic on the same line were 1692*l.* in the year 1887, and 6697*l.* in 1901, an increase of 296 per cent. in fourteen years. The capital outlay on this line was 103,311*l.*, and the working expenses in 1901 were 12,147*l.*, leaving a dividend of 6·7 per cent. on the outlay.

The line is 33¼ miles long, and passes from Antwerp through the towns and villages of Borgerhont, Deurne, Wyneghen, Schilde, Westmalle, Oostmalle, Ryckevorsel, Hoogstraeten, Vlimmeren, Vosselaer, Beerse, and Turnhout. The aggregate population of these places increased from 62,521 in the year 1885 to 80,405 in 1897, an increase of 29 per cent. in twelve years, while some of the smaller villages nearly doubled their population; for example, in 1885 the population of Vosselaer was 1109, whereas in 1897 it had increased to 2022.

There are several sidings on this line which are of great use to the owners, inasmuch as the cartage of goods is thereby obviated. The number of these sidings increases as the places grow and the traffic requires them.

The bulk of the material carried on this railway is agricultural produce; and milk, eggs, butter, etc., are put straight into the wagons by the farmer in a siding in the

farmyard. There is thus no cartage to pay; the goods are often delivered direct to the consumer's door by the light railway, and, in consequence, the prices charged are correspondingly low. The produce for export is taken to a main line station for transport to the coast often for shipment to England.

The light railways in Belgium do not enter into competition with the main lines of railways; they communicate with the smaller villages, and bring their passengers and goods into a large centre on a main line of railway. The main lines are thus allowed to do their proper work without competition with the more cheaply constructed light lines. There is, therefore, the best feeling existing between the two railways, since the light railways act as feeders to the main lines, and increase both their passenger and goods traffic.

The first of these light railways was started in 1885, before electricity was in common use for traction purposes, and consequently the majority of them are steam railways, only about 45 miles being worked electrically; on these, however, the ratio of the working expenses to the receipts is less than on the steam lines.

The light railways run, for the most part, on the sides of the main roads, only about 25 per cent. of their total length being on land of their own. They almost entirely consist of single lines with long loops in the villages, at each of which the trains stop to pick up and set down passengers, or to release or take up goods wagons. In each village a shop forms a combined station, waiting, and refreshment room, where passengers can await the

arrival of a train. There are no booking offices; the conductor of the train gives the tickets and collects the fares as is done in tramcars in England. Neither are there any railway officials at the stations except at termini, where there are sheds in which the coaches and locomotives are kept when not in use.

One effect of the light railways is to keep the agricultural labourers in the villages, where there are advantages which they could not enjoy if they were compelled to reside near their work. They are enabled to live a few miles from their occupation without any disadvantage or drawback, and their children can attend the village school or go by train to a neighbouring town and obtain an education which would otherwise be impossible.

The effect of the light railways on the value of land and property is very pronounced, always increasing it, sometimes to more than ten-fold its original value. As the villages grow the adjacent land becomes necessary for building upon, and commands a much higher price than it would as arable land. In some cases brickyards have appeared in places where, prior to the existence of the light railway, the cost of cartage would have been so great as to preclude the manufacture of bricks, and the land has consequently increased in price from 3*l.* to 16*l.* per acre to 8*l.* to 120*l.* per acre. On every side the advantages of the railways are evident, and their receipts are constantly increasing. Buying and selling the produce of the land and manufactured articles is rendered easier. Farmers and their wives can proceed to market

by rail, taking eggs, butter, or any light articles for sale on payment of their passenger fare only, and can bring back such small purchases as they may desire to make.

Prior to the establishment of light railways in Belgium, the country people had either to walk or to proceed by mail coach from one place to another, the main lines not, as a rule, passing through, or having stations at, the small villages, but only connecting comparatively large towns. The carriage of goods was, therefore, very costly, and often so great as to absolutely prevent the cultivation of agricultural products for sale elsewhere; but under the improved *régime* the farmers eagerly cultivate every square yard of land, knowing that they can find an accessible and ready market for all their produce.

The service of trains is arranged to meet the requirements of the traffic, early morning trains running for the purpose of carrying goods to market and labourers to their work, and in the evening after the hours of labour. A few trains run at intermediate times for the convenience of the less occupied public, and to carry any goods which can be dealt with during the day.

It is interesting to note the proportion of the receipts contributed respectively by passenger and goods traffic. Taking the Antwerp-Hoogstraeten-Turnhout line in the year 1901, the passenger receipts were 12,365*l.* and the goods receipts 6697*l.* or passenger receipts were 64 per cent. and goods 36 per cent. of the total receipts.

In the same year, 1901, the total receipts on the line from Spirmont to Poulseur were 5056*l.*, of which 681*l.* were passenger and 4375*l.* were goods receipts; that is,

the goods receipts were 86·5 per cent. of the whole, the remaining 13·5 per cent. being from passenger traffic.

This last example particularly emphasises the benefit conferred upon the district and its industries.

There are several stone quarries between Spirmont and Poulseur which, prior to the opening of the light railway, were but little worked, owing to the fact that cartage cost 6½*d.* per ton per mile, whereas the light railway charges only 1¾*d.* The effect of this reduction has been to increase the goods receipts from 959*l.* in 1888, the first year of working the line, to 4375*l.* in 1901, an increase of 456 per cent. in fourteen years. In the case of this line the gauge is 4 feet 8½ inches, which is the standard, and wagons exchanged with main lines run over it without transhipment.

The total cost of construction of this line, which is 5¼ miles long, was 27,154*l.* The working expenses for the year 1901 were 2872*l.*, leaving 2184*l.* available for dividend, and returning 8 per cent. on the capital outlay.

Between Poulseur and Spirmont there are five trains per day each way between the hours of 6 a.m. and 6 p.m. The first class fare for the whole distance is 6*d.* and the second class 4*d.*

Another instance of an agricultural line is that connecting Wavre and Jodoignes, and passing *en route* through the villages of Gastuche, Archnnes, Grez Doiceau, Longueville, Roux Miroir, and Incourt; its length is 16 miles, and it cost 65,870*l.* to construct. The receipts in 1901 were: passenger traffic, 4036*l.*; goods traffic, 2870*l.*

Wavre is a market town of about 6000 inhabitants,

and there is a large weekly influx of farmers from the surrounding country with their produce and live stock for sale. Amongst the sidings connected with this line is one running to a chemical manure factory, which supplies the neighbouring farms.

Like other Belgian light railways, this line runs for the most part along the side of the high road, where the district derives the benefit, not only of having a service of trains passing close to the houses, but of the repairing of the roads between the rails and between the tracks, together with two strips 2 feet wide outside the rails, which is done by the light railway company.

Objects of the Light Railways.

Speaking generally, the object of the Belgian light railways is to supply a quick and ready means of transit for both goods and passengers from one village to another or from the surrounding country to the main line stations. There is no endeavour made to compete with the main railways; on the contrary, every effort is made to avoid competition. Where two towns are connected by both main line and light railway, the former takes the larger towns and the latter the villages on the route, and the fares for both goods and passengers are so arranged that between the two large towns there is a balance in favour of the main line. By this arrangement the support of the main lines is secured, and they welcome the light lines as local carriers for them.

The light railways have thus the effect of bringing

the rural districts in touch with the main lines, and agricultural produce can quickly and cheaply be taken to the large towns for sale. There is, in fact, probably no country which is less dependent upon foreign countries for the necessities of life than Belgium, and which would feel less any foreign depression of trade. The reason of this is easily traced to the existence of their unique system of light railways, which stimulates the cultivation of the land, rendering the farming of formerly isolated districts not only a possible but a lucrative occupation.

As with agriculture, so with other branches of industry. In some parts of Belgium large areas of granite rock were unworked owing to the great cost of cartage; but since the opening of the light lines, quarries have been opened and have become staple industries of several districts.

The National Light Railway authorities find that the effects of the construction of light railways have been:—

1. To make communication faster and cheaper between the country districts and the towns, to the great advantage of agriculture.

2. To foster trade and industry.

3. To abolish almost entirely cartage of bulky substance, which is always high.

4. To cause a fall in the price of all articles of consumption brought into the district.

5. To stimulate new industries, and provide more employment for workmen.

6. To render substances valuable which were previously worthless, by making it possible to work them.

7. To save the Government considerable sums of money by doing away with many mail coaches, the mails being conveyed gratis by the light lines.

8. To reduce the cost of maintaining high roads.

9. To increase the receipts of main lines.

The National Light Railway Company of Belgium.

Let us now inquire how it has been possible to provide Belgium with so complete a network of light railways, and to run them through districts for the purpose of developing them where the traffic had to be created. Obviously private enterprise would not construct a line through a district which would require a few years to develop into a paying concern. This being the case, and realising the great importance of opening out the rural districts, even at the risk of temporary loss, the Belgian Government gave every encouragement for the formation of the National Light Railway Company. Such a company had for years been talked about, but it was not until 1885 that it became an accomplished fact.

On the formation of the National Light Railway Company the National Treasury advanced the sum of 40,000*l.* to cover preliminary expenses, and also guaranteed to contribute annually, if necessary, a sum not exceeding 24,000*l.* to assist in paying the interest on the bonds issued by the company. The State agreed to

still further assist by taking up a limited number of shares in any light railway exploited by the company.

This support on the part of the State makes it a comparatively easy matter for the company to borrow money at 3 per cent., for which they issue bonds.

If a district desires a light railway, the local authorities apply to the directors of the National Light Railway Company to construct one. The company then proceeds to examine the district through which the line would run, and to form an estimate of the capital outlay necessary to complete the construction. If, after having done this, the directors consider the scheme sufficiently promising, the province and locality through which the line will pass have to guarantee not less than 50 per cent. of the money required. The actual payment of the money may be spread over a long term of years. Private individuals may, if they desire, contribute, but they have to pay in full at once. The State then makes up the deficit.

The capital necessary for the construction being then guaranteed, the directors of the Light Railway Company borrow the money on 3 per cent. bonds on the whole of their undertakings.

The actual working of the line until the province and district have paid their last instalment, when the line becomes their property, is let by public tender, preference being given to local contractors, or to public authorities, who are required to run a minimum service of trains which may be increased, according to the requirements of the traffic. Beyond a certain minimum

payment, the contractor is paid a pre-arranged percentage of the receipts.

In this way the National Light Railway Company is able to construct lines through districts which, while not promising immediate profitable returns, show indications of developing into paying undertakings, the result being that new districts are opened up, and fresh industries created and developed, to the benefit of the district in particular and the country in general.

What Can be Done in England.

What has been done on the Continent through this system for the benefit of agriculture, can be done here with similarly beneficial results; hundreds of acres of land in this country are at present lying fallow because of the impossibility of realising a profit on the cultivation, although we import dairy produce to the extent of thirty millions per annum.

Light railways, by themselves, may not produce the best possible results, but in combination with the factory system of associated farming, which, first in America, and subsequently on the Continent, has proved so successful, there is no reason why a large portion of the land at present out of cultivation should not help to reduce the imports by a considerable amount.

Light railways, on which electricity is the motive power, would give considerable advantage to English agriculture over the older system on the Continent, where steam is the general motive power, as the elec-

trical generating station might also comprise the factory where the milk from the associated farms could either be sterilised, or made into butter and cheese; and the cost of running the machinery could be reduced, by employing the men who run the generating station also to look after the machinery necessary for the treatment of the milk.

The associated farms could then have power at a cheap rate for thrashing, cutting, grinding, or for any other purpose required, as well as the electric light which is at present looked upon as a luxury.

Attention has already been drawn to the fact that the Light Railways Act of 1896 was passed with the intention of promoting the interests of agricultural and fishing industries in this country.

With this object in view, the Government offered to advance free grants of money, or loans, on certain conditions to an extent not exceeding one half the total cost of construction of the lines. The conditions attached to these loans are, however, such as will not conduce to the successful working of the lines, and can seldom be realised in this country.

The first condition is, that a railway company already in existence shall construct and work the light railway; and a second is that landowners, local authorities, and other persons locally interested, shall by free grants of land or otherwise give all reasonable assistance and facilities in their power for the construction of the railway.

It is, of course, highly essential that the approval and, if possible, the support of the existing main lines

of railway be secured, but it is neither to their interest, nor to the interest of the light railways, that they should construct and work them. The methods of working in the two cases are entirely different, and it is highly improbable that both could flourish under the same management.

The light railway has a field of its own, with special aims and conditions, which can only be fostered by special methods and by people specially interested in and adapted to, that particular class of work. These aims and conditions are not only not antagonistic to main line enterprise, but, on the contrary, are such as to promote the interests of, and increase the traffic on, the main lines. It is only necessary to convince the main line authorities of this fact and their approval and support are gained. This is amply demonstrated in Belgium with the best results.

In the second place, State aid for the establishment of light lines should not be conditional on landowners giving free grants of land. These conditions leave the controlling influence in the hands of the landowners, who form but a small proportion of the population. The desires of the local authorities and the requirements of the people, which should be the only *sine quâ non* in order to obtain State aid, may be frustrated by people who happen to own the land.

If landowners do not endeavour to carry out the reforms themselves, or to associate with others for the benefit of the people who rent their land, it should be possible to act without their assistance or consent.

To illustrate the effect of the Light Railways Act, as it at present exists, there is one case in which last year the Light Railway Commissioners recommended the Board of Trade to authorise the construction of a light line about 12 miles in length where the conditions are exactly those to which the Act is intended to apply. A Treasury grant will also be forthcoming providing the necessary conditions are satisfied. The local authorities are not only anxious to have the line, but are willing to advance a considerable sum for its construction. Some of the smaller landowners are also willing to render all the assistance in their power, but the large landowners will not give any land for the purpose, nor will they sell at agricultural value. Thus a district of about 120 square miles is still without a railway; the inhabitants continue to pay six shillings a ton for cartage of coal and other necessaries, the fishermen are often obliged to sell their fish for manure instead of for food, and cattle have to be taken long distances for transport to a market.

The district is an ideal one for a light railway, the land being fertile and rich in minerals, but the action of the landowners is keeping it from contributing as it should do towards the national welfare.

The cost of completely equipping a narrow-gauge line for 12 miles through this district, including generating station, would be about 50,000*l.*, and if it is considered to serve a mile of land on each side of the railway, the 24 square miles served being equal to 15,360 acres, the cost of the line would be about 3*l.* 6*s.* 6*d.* per acre, or slightly less than 2*s.* 4*d* per acre per annum, allowing

3½ per cent. interest. This is a very small amount when it is considered that in America agricultural land has under similar conditions increased in value from 5*s.* to 10*l.* and 20*l.* per acre.

No farmer would object to pay this amount for the extra facilities given, and if the landowners would pay one-third of the increased values which would be obtained from the land to a company to induce them to construct a line, and one-third to the local authorities, there would be very few districts without a light railway, since then the light railway companies would have a direct interest in the land being developed in the best possible way, and landowners, shareholders, and local authorities would have a common interest in the development of the district.

If we have to wait for landowners it will be impossible to make great progress; commercial men must be induced to enter the field, with all the help the Government can give them ; the conditions of labour and earnings will then be so assimilated to those in the towns, that agricultural employment will be sought after, and the country will benefit by the removal of a large proportion of the town population in to healthier and better surroundings.

There is a 30 million per annum trade to work at, with sufficient land for the purpose, and all that is required is the necessary enterprise in order to produce results equal to those of a good manufacturing business.

The following article * on 'Carriage of Merchandise on Electric Tramways,' is inserted by kind permission of Mr. Thomas Upton, goods traffic manager to the South Lancashire Tramways and Liverpool and Prescot Light Railway companies.

The proposal to carry merchandise on tramways is not a new idea, for practically every Act or order authorising the construction of tramways contains a schedule of rates to be charged for the conveyance of merchandise, parcels and animals, yet up to the time of the introduction of electric traction little or no advantage had been taken of the powers thus conferred, presumably because tramways could offer no convenience or facilities for dealing with these classes of traffic.

In view, however, of the extension of electric tramways into rural districts, thereby joining up various systems and towns, they become not only highways for the through conveyance of merchandise, but excellent feeders to the railways of the country in general; as evidence of this, it is only necessary to refer to the interworking arrangements at present in operation between the Great Central Railway Company and the South Lancashire Tramways Company, whereas passengers are booked through from any station on the Great Central System to Leigh and *vice versâ*.

The through booking of parcels, without extra charge over the ordinary railway rate, for conveyance on the

* This excellent article appeared in the *Electrical Review* of August 4, 21 and 28, 1903.

tramways, is also a feature of the arranegments existing, and this may be said to have given practically direct access to the Great Central Railway to many districts they previously could not possibly have hoped for.

The services thus inaugurated are appreciated by the public and are a success, giving as they do, in regard to parcels, frequent and regular deliveries, with quicker transit than previously existed in the district.

This inter-working with the railways for parcels, augurs well for its extension to heavy merchandise; and this brings us to the question of the "Classification of Goods."

There is, at present, very little similarity between the classification used by the railway companies and that quoted in various acts or orders authorising the construction of tramways and light railways.

In the latter case, the classification appears to be somewhat loosely drawn out, and without due regard to the amount chargeable per ton per mile, in relation to the class and damageable nature of the articles to be conveyed.

For instance, we find earthenware (Class 2, Railway Classification) included with such articles as nails, anvils, etc. (Class C, Railway Classification), and there is no distinction in other traffics; e.g. "tiles" are simply shown as such, although there are several kinds, some of high value and easily damaged, necessitating more careful handling and packing.

It is therefore obvious, that before appreciable progress can be made in the matter of tramways and light

railways becoming, as they should be, feeders to the trunk lines of railways, with through bookings and working arrangements, the "classification" must be thoroughly revised and brought into line with that in use by the railways issued under the Railway and Canal Traffic Act, 1888, and revised from time to time to meet the requirements of trade.

It is also desirable that this should be done in the interests of the traffic that will be conveyed by tramways and light railways, for certainly articles of a high market value should pay in excess of articles of a lesser market value.

Railways, too, are not required to provide wagons for certain traffics, such as lime and salt in bulk, ammoniacal liquor, creosote, coal-tar, gas-tar, gas-water, or gravel tarred for paving, when tendered in such a manner as would damage the wagons; but in the regulations as to rates in tramway and light railway Acts or Orders, no such provision is made, although the wagons used by the tramways would be more costly than railway wagons.

The regulations governing the forwarding of the various traffics by tramway alone need not in all instances be so stringently drawn up, as in the case of railway transit, but in the matter of through-booked and worked traffic it would be policy to conform to the railway regulations in operation for the time being, thereby saving considerable trouble and friction both with the public and the railway companies.

The carriage of explosives, and very long articles such as masts, telegraph and scaffold poles, should not

be entertained, constituting as they would dangerous and inconvenient articles in the streets of towns and other places, to say nothing of the sharp corners and turn-outs to be negotiated.

The regulations governing the conveyance of merchandise by tramway or light railway should be drawn out to protect the carrier as far as possible under the various Acts relating to Insurance and Values of Live Stock, the Carriers Act, etc., particular attention being paid to the conditions for the carriage of milk and articles of a brittle and damageable nature. These latter, including furniture loose, musical and scientific instruments, should only be conveyed at the risk of the owner.

It is important that consignment notes for various traffics, giving the regulations under which such traffics are carried, should be carefully drawn out, and obtained from all senders of traffic, duly signed at the time of forwarding; otherwise, costly litigation is sure to follow, not only causing monetary losses but giving a bad impression and upsetting the public generally.

It has been asserted that an increased "through" traffic and lessened "local" traffic on railways would tend to cheapen the existing rates, but this does not seem to be, strictly speaking, quite correct.

It is well known that in the case of merchandise conveyed by railway over considerable distances, the maximum rates allowed to be charged decrease in proportion after the first twenty miles, then more so for the next thirty miles, again slightly for the next fifty miles,

and then for the remainder of the distance; but this is not so in regard to "station and service" terminal charges.

Therefore, in respect to the charges other than for actual conveyance on the railway, there is no reduction, no matter what the distance carried may be; still, the terminal charges at all centres are not the same, as will be readily understood, it being obvious that the cost of labour, maintenance, etc., and rates and taxes in some places are much higher than in others.

Although terminal charges are not particularly specified in the Tramway and Light Railways Act or Orders, a clause, somewhat as follows, is usually inserted :—

"In the case of goods, animals and things, the company may demand such charges as are reasonable for loading and unloading the same, and if any difference shall arise as to the reasonableness of any such charge, the matter in difference shall be settled by the Board of Trade."

This at once permits of "service" terminal charges being added on to the conveyance rates, and from the table on p. 74 it will be seen that there is no necessity for a "station" terminal, the maximum rates allowed for conveyance of merchandise on tramways being so much more than those allowed to railway companies, as to render the necessity for this superflous, although goods depots would have to be maintained, with all the costs incidental thereto; except in cases where two or more companies or systems are concerned, in through-booked and worked traffic, when, of course, a special allowance

out of the through rate would have to be made to the forwarding and receiving undertakings for the use of their depots and appliances thereat—i.e. a "station" terminal allowance.

MAXIMUM STATION AND SERVICE TERMINALS.

The terminal charges given on p. 74 are common to all Railway Rates and Charges Orders Confirmation Acts, 1891 and 1892, except to parts of the Caledonian and North British Railway Companies' systems.

It will therefore be seen, that whereas the railway conveyance rates decrease according to the mileage carried, no such gradation exists with regard to tramway and light railway rates, as instanced in the schedule on p. 74 taken from one of the latest Light Railway Orders.

For all coal, coke, culm, charcoal, cannel, limestone, chalk, lime, salt, sand, fireclay, cinders, dung, compost, and all sorts of manure, and all undressed material for the repair of public roads or highways, 2*d.* per ton per mile.

For all iron, iron-stone, iron-ore, pig-iron, bar-iron, rod-iron, sheet-iron, hoop-iron, plates of iron, slabs, billets and rolled-iron, bricks, slag and stone, stones for building purposes, pitching and paving tiles, slates and clay (except fire-clay), and for wrought-iron not otherwise specially classed herein, and for heavy iron castings, including railway chairs, 2½*d.* per ton per mile.

In respect to merchandise comprised in the under-mentioned classes.	Maximum Terminals.				
	Station terminal at each end, per ton.	Service Terminals.			
		Loading, per ton.	Unloading, per ton.	Covering, per ton.	Uncovering, per ton.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
A	0 3	—	—	—	—
B	0 6	—	—	—	—
C	1 0	0 3	0 3	0 1	0 1
1	1 6	0 5	0 5	0 1½	0 1½
2	1 6	0 8	0 8	0 2	0 2
3	1 6	1 0	1 0	0 2	0 2
4	1 6	1 4	1 4	0 3	0 3
5	1 6	1 8	1 8	0 4	0 4

MAXIMUM RATES FOR CONVEYANCE—L. & N.W. RAILWAY SCHEDULE.

In respect of merchandise comprised in the under-mentioned classes.	For the first 20 miles, or any part of such distance, per ton per mile.	For the next 30 miles, or any part of such distance, per ton per mile.	For the next 50 miles, or any part of such distance, per ton per mile.	For the remainder of the distance, per ton per mile.
	d.	*d.*	*d.*	*d.*
A	0·95	0·85	0·50	0·40
B	1·25	1·00	0·80	0·50
C	1·80	1·50	1·20	0·70
1	2·20	1·85	1·40	1·00
2	2·65	2·30	1·80	1·50
3	3·10	2·65	2·00	1·80
4	3·60	3·15	2·50	2·20
5	4·30	3·70	3·25	2·50

For all sugar, grain, flour, hides, dye woods, earthenware, timber staves, deals and metals (except iron), nails, anvils, vices and chains, and for light iron castings, 3*d.* per ton per mile.

For cotton, wool, drugs, manufactured goods and other wares, merchandise, fish, articles, matters or things not otherwise specially classed herein, 4*d.* per ton per mile. For every carriage, of whatever description, 1*s.* per ton per mile.

The company shall not be bound to carry single articles of great weight, but if they do carry such articles they may charge: for the carriage of any iron boiler, cylinder, or single piece of machinery, or single piece of timber or stone, or other single article, the weight of which, including the carriage, shall exceed 4 tons but shall not exceed 8 tons, such sum as the company may think fit, not exceeding 2*s.* per ton per mile.

For the carriage of any single piece of timber, stone, machinery, or other single article, the weight of which, with the carriage, shall exceed 8 tons, such sum as the company may think fit.

The railway companies do not, or very rarely indeed, charge their maximum rates; therefore, and especially where railway companies cover the same ground as tramways or light railways, the "Tramway and Light Railway Rates Schedule" is of little use.

The rates charged for tramways and light railway traffic must not in any case be higher than those charged by the railways, but should be considerably lower, the

total working cost of tramways being so much less than that of railways.

In the case of coal, it is very questionable whether it would not be best to leave the carriage of this entirely to the railways ; they already have sidings under the colliery coal shoots, and the cost of running electric tramway sidings thereto would be very heavy.

Moreover, the colliery proprietors do not readily entertain the idea of two sets of metals side bb side under one screen, which would become necessary, seeing that the wheels of one class of wagon are not made to run on the same rails as the other, and *vice versâ*, to say nothing of the prohibitory clauses in the Orders and Acts.

While admitting there are numerous difficulties in the way, it would be of great benefit if means could be found and arranged for the working of tramway wagons over short lengths of railway sidings into works, etc.

The colliery proprietors also point out the difficulty of shunting the two kinds of wagons, the specially designed points which would be necessary, and many other difficulties, also that the rates for the conveyance of coal by railway are so low as not to invite them to erect special screens and facilities for dealing with tramway traffic alone. The illustrations on p. 77 show this.

The distances between the places mentioned are about equal by both rail and tram.

The maximum rates allowed by the tramway and light railway schedules might, however, be charged in districts not opened up by railways, and where cart-

From	To	Distance Miles.	Rail charge, per ton, whole distance.	Tramway charge, say 2*d.* per ton per mile, whole distance.	Description of traffic.
			s. d.	*s. d.*	
Haydock	Liverpool	15	1 4	2 6	Coal
St. Helens	Liverpool	12	0 11	2 0	Coal
Liverpool	Atherton	24¾	7 3 including cartage at Atherton	at 4*d.* per ton per mile, 8*s.* 4*d.* (station to station only)	Raw cotton

age charges are extremely heavy; as, for instance, from Corwen to Cerrig-y-Druidion, and Bettws-y-Coed to Penmachno, each distance about 10 miles and the cartage being at the rate of 10*s.* per ton. A light railway scheme for joining up the places named is in course of preparation at the present time.

While admitting that it is possible to do away with much of the handling of merchandise now performed by the railway companies, on account of transhipment at junctions, it must not be overlooked that the fault lies to a great extent in bad loading and short junction lines.

All railway companies run "roadside wagons" between their principal stations on to branch lines, so that merchandise shall not be handled more than once or twice on a journey, and then only when it is necessary to put out at a junction, otherwise the "roadside van" would pass through, working on to another branch from that to which the goods were going.

The transhipment of goods on railways is not so frequent as it would seem to be, and everything possible

is being done to curtail it, but at the same time it does not increase the charges made for the carriage of goods.

A certain amount of transhipment will always be necessary on tramways serving districts not on a continuous line of route, and although a train would consist say of two cars only, they would start with goods for various places, lying in different directions, besides putting out and picking up *en route.*

Now supposing such a train started from Liverpool for Bolton, it might be found on arrival at Atherton that the goods were principally for Leigh and Lowton, therefore the train would be diverted accordingly, and the few goods for Bolton would have to be transhipped to another car.

Moreover, from "spur termini," such as Tyldesley and Lowton, there would probably be some goods for Bolton, but it would not pay to run them through, neither would it be policy to divert a train and delay it considerably for the purpose of picking up the traffic at its starting points. Again, it would not do to run a number of wagons through to a given point, such as Bolton, with small loads of perhaps three or four packages or hundredweights.

In such cases it certainly becomes necessary to tranship goods at a convenient centre, very much after the system adopted by railway companies.

Of course, this would not apply to full loads, but to groceries, provisions, drapery, and such-like traffic, in which consignments consist of small packages weighing from a few pounds to possibly 3 to 5 cwt. each.

To deal with general merchandise, and, for that matter, large consignments in most instances, it becomes necessary to establish depots at convenient places along the line of route, for distribution by carts or other vehicles to the consignees, and to which also the public could convey their merchandise for forwarding to any destination, if they felt so inclined.

In short, the depot would have to be worked on exactly similar lines to those adopted for a railway goods depot.

It need hardly be pointed out that many firms buy their various commodities in bulk, leaving the greater part in the hands of the carrier to warehouse at fixed charges, and issuing orders to customers for small quantities of the bulk, which the latter would collect themselves, or instruct the carrier to deliver on their behalf. It is therefore evident, for the extra labour and cartage involved, other charges must be made over and above that originally incurred for freight and delivery.

These charges are known as "split" delivery charges, and are a source of much revenue. They are brought about entirely by the *modus operandi* adopted by wholesale dealers and merchants, adding considerably to the cost of conveyance; but they cannot be placed to the account of excessive railway rates.

It may be suggested that much of the present cartage of heavy goods, such as raw cotton, etc., would be done away with by running sidings off the tramways into mills and works; this is quite agreed so far, but who is to bear the cost of such sidings?

Surely not the tramway or light railway company. The traders have the benefit of the sidings; obtain cheaper rates by reason of performing the unloading or loading of goods; and are in a position to suit their own purposes, or to order their traffic by other routes and means if everything were not done exactly to their ideas and wishes—when the sidings would remain so much dead loss to the tramway or light railway company.

It therefore appears to me that the proper course is, for the traders who desire sidings into their mills or works to pay the cost of them, and then, if they did not wish to handle their traffic by that means, no loss would fall on any person other than themselves.

Tramways and light railway companies must follow in the footsteps of the railway companies in these matters; and there is no doubt that firms, when they find it is worth their while to go in for sidings, will do so at their own cost.

In connection with this matter, it has been frequently pointed out to the writer by firms that they would not allow the wagons to enter their yards, provided sidings were laid in, until certain hours; that they would have to be kept back at some convenient place until then; that they could not guarantee to unload the same day or day following.

Again, that some particular portion of a consignment would probably be wanted immediately, and the rest not for some days; that they had no suitable place for storage, and as a consequence would detain the wagons to suit their convenience.

By having the goods at a depot they get exactly what they require of a consignment, leave the rest behind, and the wagons are not delayed, the company unloading to meet their own requirements, while the small charge made for warehousing is cheaper and cannot be considered against the working value of that portion of their own works, which would otherwise have to be utilised for storage purposes.

In regard to many traffics passing in fair quantities, it would no doubt be possible to do away with much of the present handling, such as loading from consignee's premises to lorry, lorry to railway wagon, railway wagon to lorry, and lorry to consignee's premises; to say nothing of the extra handling, that takes place when merchandise is taken into railway depots without rail connection and afterwards carted to a depot with such facilities.

Such goods would be loaded on to an ordinary lorry as at present, excepting that instead of being placed direct into the lorry, the lorry would contain three or more crates or detachable bodies, the goods being packed into such crates.

The lorry would then proceed alongside the stage, and the crates would be rolled off, by means of rollers attached to the under-frames, on to such stage or wagon; the reverse operation would be necessary at the destination.

Thus the handling would be considerably less than by any means adopted at the present time. However, this system would not be of much assistance with a number of small consignments, requiring delivery in

various directions, as the time taken up would be too long; the goods would be more liable to damage, by being pulled about to get at articles required *en route*, to avoid duplicating the cartage necessary for delivery; and it would not be possible for the depot to properly check, enter up such goods, and keep proper records.

Detachable crates as mentioned would tend to save a certain amount of transhipment of goods, but would not entirely do away with it.

Tramways and light railways in rural districts should be of incalculable benefit to agriculturists, in that they offer the very facilities which are so much agitated for; they form a cheap, quick and ready means of getting to the railways, and the question of high rail rates to the large central markets should soon be a thing of the past.

It is common knowledge that the foreigner invades our markets on account of the alleged preferential tariff he is favoured with, but it must not be overlooked that he sends in very large quantities in one consignment, consequently the railway company can offer a so much cheaper rate for conveyance of the produce.

It would be an easy thing for a shed to be built alongside any present railway siding, with tramway sidings on the opposite sides of the stage, and for the produce of a district served by tramway or light railway to be brought at low rates and in small quantities to the shed, and there handed over to a person appointed, who would keep a proper record of the produce, sender and charges incurred.

The produce might then be bulked and sent away in large quantities to the various markets; the railway companies, on account of the large bulk travelling at one time, being compelled to give a low rate and quick transit, by which means the excessive rates question would vanish into thin air.

The receipts on the produce and the rail charges, etc., would be rendered to the party responsible, who would divide them in proportion to the traffic forwarded by each farmer or grower, and hand over the remainder to those entitled to receive it.

To carry out this idea, it would be necessary for the farmers and growers generally to form associations in their various districts served by tramways and light railways, and appoint their own servants.

By loading the traffic in bulk from tramway wagons to railway wagons, they would also save considerably on terminal charges—in fact, after the initial cost of the tramway sidings and necessary shed alongside the railway siding, all terminal charges should practically cease.

For large consignments of produce in truck loads, detachable bodies should be provided by the tramways or light railway companies, of such a size as to be capable of riding within an ordinary railway drop-side wagon body.

Such detachable bodies should be taken over from the original "deck" to the railway wagon, by means of rollers attached to the under-frames; and the railway companies should be allowed to use these bodies on the direct return journey homeward for other traffic, much

after the same manner as is at present done with foreign stock.

The rolling stock necessary for dealing with merchandise traffic on tramways or light railways is one of much importance, and of course depends to a great extent upon the traffic in the district to be served. However, my opinion favours five distinct kinds, viz. :—

1. Flat or deck wagons, suitable for carrying "tubs" or "crates" on rollers, and by removing these for such traffic as timber, girders, portable engines, machinery, boilers, etc.

The "deck" to be provided with rings for roping purposes, also provision for bolsters and stanchions, to be fixed as desired.

The "tubs" should have open tops and be used for rough traffic; the "crates" to be covered boxes with end doors, in order to protect perishable merchandise against the weather.

The "tubs" and "crates" to be of various sizes, say, one, two and three to a wagon, to meet large and small consignments.

2. Box wagons, ventilated at the ends, with sliding side doors for general merchandise requiring covering, with clips inside for fixing bars and hooks for "meat traffic."

3. Open wagons—side drop doors—for traffic not requiring sheeting, not suitable to carry in box wagons, such as glass, acids, iron, oils, grease, etc.; and traffic requiring sheeting, but necessary to be lifted by cranes, etc.

4. Coal wagons, with side and bottom drop doors.

5. Cattle wagons, open tops, side doors and movable partitions. Such wagons to be used for "scrap" metal, coke, etc., traffic when not required for cattle.

The carrying capacity of all wagons should not, I consider, be less than 16 tons.

The method of dealing with the men who handle the merchandise traffic must vary according to the distance covered and the quantity of traffic dealt with, also the time necessary to work same.

The drivers and guards would be able to deal alone with coal and full loads of traffic, "siding to siding" in small areas, and there would only be the question of time to consider; whereas, with general merchandise over a larger area, necessitating depots, collecting and delivery facilities, etc., there would be the clerical and porterage staff to consider also, in which case a daily wage would be the best, the drivers and guards assisting at depots with traffic generally when not engaged in the actual transit of same from place to place.

There are also so many matters to be continually borne in mind, by the clerical and porterage staff actually dealing with the receipt and forwarding of traffic, that it becomes a necessity to issue for their guidance special instructions in the form of "standing orders" covering such matters, as—

The proper quotation of rates, with the necessary references to risk for loss, damage or delay.

Injuries to the public and servants of the company on the latter's premises.

Supply of plant, trucks, sheets, sacks, ropes, etc. to the depots, and the disposal of surplus plant *en route.*

Disabled stock and loads requiring adjustment in transit.

The proper loading and sheeting of wagons, and binding of loads to ensure safe transit.

Collection and delivery of merchandise, and the proper handling of it.

Warehousing of merchandise, provisions, etc.; and wharfage of oils or other dangerous liquids, vegetable fibres, etc.

Correct invoicing of merchandise, charges, etc.

Loading of live stock in disease affected districts, and the cleansing of wagons as required under the Board of Agriculture regulations.

Merchandise received unentered, particulars to follow, and missing.

Seizure of goods at depots under writs, and stoppage of goods in transit.

Proper rendering of accounts and keeping of correspondence.

Accommodation provided at depots, etc.

Another matter of some importance is that of "sundry charges" made to firms by the railway companies for services rendered, but which many consider should be or are included in the rate charged for conveyance.

When the nature of the services performed, however, are looked into, it will be seen that the charges so made are not, and could not have been, included in the

original rate for conveyance, therefore it may be reasonably expected that somewhat similar charges will be made in tramway and light railway working, and will include charges for—

Cartage beyond a fixed boundary of, say, one mile radius from any depot at which the rates charged include collection or delivery service.

Special cartage rate for traffic conveyed at "station to station" rates, or for articles of exceptional weight or bulk, say over 3 tons each, and requiring special facilities for handling.

Small charge for the special facilities provided by the company for loading or unloading of such heavy articles.

"Split" delivery charges, where firms send merchandise in bulk, at a cheaper rate than would otherwise be charged, and then divide up the bulk into small portions and instruct the company to deliver to various customers.

Charges for second cartage through no fault of the company.

The loading and unloading of merchandise where such service is not included in the rate charged for the conveyance of the merchandise.

Shooting, weighing, measuring, screening and making up of flour, grain and seeds.

Cellaring and stocking of beer at hotels, etc.

Weighing out, uncovering and re-covering, or opening boxes and replacing of bacon and hams.

The cording and casing of teas, etc.

Marking and numbering of packages.

These services are of daily occurrence, and take up a great deal of valuable time which can ill be spared, and in many instances men's time is wholly occupied in the work; the carriers are, therefore, put to expenses they would not otherwise be, or otherwise it could be included in a conveyance rate.

A trader will state that his work only occupies the matter of a few minutes, and that the charge made is unreasonable; but consider all such minutes occupied on behalf of the many and various traders added together, and the case for such charges being made is strengthened and apparent, although the writer is of opinion that the charges made in many cases might be reduced.

This, however, is unlikely, as the railway companies do not care for the work and responsibilities entailed thereby.

The conveyance of merchandise on electric tramways and light railways will have, without doubt, far-reaching and beneficial effects to the traders in general, inasmuch as they will obtain quicker transit, less damage to their traffic in transit; besides the rates for conveyance being considerably reduced, in some cases, probably, as much as 50 per cent., but, generally speaking, say 25 per cent. all round.

In country districts the introduction of electric traction must be of incalculable importance to the agriculturists; and farmers and land-owners would do well to encourage such traction by all means in their power, giving as it does the very facilities required, being far

superior to any service of motor-vans that might be put on the roads.

Although the latter would be able to go up to the farms, the tramway could be laid so as to be equally convenient to the farmer, for the motor-van would be only able to take, say, six or seven tons, and would have to go in most cases long distances to the nearest railway station.

On the other hand, the farmer would be in a position to load at will several tram wagons with a capacity of, say, 16 tons each, saving the cost of loading to motor and from motor to railway wagon at the railway station; reducing the rate accordingly, and getting a quicker transit without transhipment of the produce and the consequent delay.

This would be brought about by the use of flat-deck wagons with detachable bodies; and in many cases the tramways would be in a position to convey the traffic to the markets direct, at rates much below those charged by the railway companies, and in less time.

For small quantities of produce, a special van could be run at stated times each day round to the various farmers, and the traffic gathered *en route* at much less cost than could be done by motor-van or by carts.

It need hardly be pointed out that heavy motor-vans would not be able to go everywhere on a farm, and that it would be necessary for the farmer to bring his produce to some suitable spot on his land for loading purposes.

It would be idle to attempt in this article to organise a complete system of merchandise distribution; but if

facilities were given, it is safe to say that the advantages to be derived therefrom would be fully appreciated and the traffic would grow rapidly, and during developments experience would be obtained as to the requirements of the various classes of merchandise, which it is impossible to fully appreciate in advance. Further, the effects of such developments upon the districts covered is bound to be of far-reaching extent, in furnishing facilities for the distribution of merchandise which have been hitherto unobtainable.

This leads up to the question of 'Terminal Charges, and the Conveyance of Merchandise on Electric Tramways and Light Railways,' by Mr. T. Upton, goods traffic manager to the South Lancashire Tramways and Liverpool and Prescot Light Railway.

There appears to be little doubt, but that so soon as the conveyance of heavy merchandise and live stock on tramways and light railways has been developed to a moderate extent, the complex question of terminal charges will have to be dealt with by the carriers, be they corporations or private companies, otherwise it will be forced upon them by the Board of Trade or the traders themselves; it would, therefore, be well to look carefully into the question as far as, at any rate, to know exactly how and in what position we stand in respect to the matter at the present time.

According to the various schedules of rates and charges, embodied in the various Tramway and Light

Railway Orders with which the writer has come in contact, no mention is made of terminal charges, except in a broad and vague manner as follows : "In the case of goods, animals and things, the company may demand such charges as are reasonable for loading and unloading the same, and if any difference shall arise as to the reasonableness of any such charge, the matter in difference shall be settled by the Board of Trade."

It would be interesting to know if this vague style of reference to labour charges, over and above the actual conveyance rate per ton per mile, or in other words the "service" terminal, is an oversight, or deliberately done with a view to raising the whole question at a most unwelcome period of the development of the carriage of merchandise on tramways and light railwavs by electricity ; particularly seeing the Board of Trade lay much stress on the matter in regard to railways, and that such charges have been in the past and even up to the present the cause of bitter and frequent complaints, as well as litigation between traders and the various railway companies.

It would be reasonable to suppose that in the case of such dispute with regard to tramways and light railways, the Board of Trade would rely upon the schedules of charges authorised to be used by railway companies for such similar services, but possible at a somewhat reduced rate, while the loss in revenue and the disorganisation of traffic and the keeping of accounts and records during the period the question was under discussion to a final settlement, would be enormous,

which fact is amply illustrated by the chaos caused during the revision of rates and charges in connection with the railways, in the years 1892 to 1895.

The Railway and Canal Traffic Act, 1888, enacts that "every railway company shall submit to the Board of Trade a revised classification of merchandise traffic, and a revised schedule of maximum rates and charges applicable thereto, proposed to be charged by such railway company, and shall fully state in such classification and schedules the nature and amounts of all *terminal* charges proposed to be authorised in respect of each class of traffic and the circumstances under which such terminal charges are proposed to be made. In the determination of the terminal charges of any railway company, regard shall be had only to the expenditure reasonably necessary to provide accommodation in respect of which such charges are made, irrespective of the outlay which may have been actually incurred by the railway company, in providing that accommodation."

From the foregoing paragraph, it is quite clear Parliament had in view and anticipated various charges other than for loading and unloading as mentioned in Tramway and Light Railway Orders generally, and seeing that the conveyance and handling of traffic by the last mentioned, must be dealt with on precisely similar lines, with depots and other appurtenances, that railway companies do with their traffic. It does not seem to be correct that the matter can be left in so unsatisfactory a state much longer, at any rate, not after

the conveyance of heavy merchandise on tramways and light railways becomes a standard business.

Adverting to the question of "through" running or working of traffic over two or more systems, the matter of terminal allowances becomes one of much importance, as it would be an absolute necessity to make special allowances out of the aggregate rate for conveyance for terminal services. It would be obviously unfair for one undertaking to provide the necessary accommodation, machinery and labour for handling the traffic at its end and another undertaking who did not interfere with the traffic beyond providing the power to convey over its system, to receive equal payment out of the aggregate rate for conveyance, provided even the mileage was exactly the same, which would be very unlikely in any case.

Special allowances for terminal charges over and above the rate charged for conveyance, so far as labour is concerned, is fully recognised and allowed by the Board of Trade to tramways and light railways dealing with merchandise traffic; but I cannot imagine that the latter will ever be allowed to develop such on the lines adopted by the railway companies in, that any charges not laid down in their schedules to the Rates and Charges Confirmation Orders Acts, they can make without interference from the Board of Trade or other body, as instanced by their ever-increasing number of labour and sundry charges, recorded in special books issued to the company's officials, and endorsed on the covers, "Private and for the use of the Company's Staff only." The

charges recorded herein are not mentioned in any book issued by or authorised by the Board of Trade in respect to railway rates and charges, although it is possible some, by a big stretch of imagination, may be brought within the sphere of "Special Charges" or terminal charges allowed to be made under the various Railway Rates and Charges Confirmation Orders Acts of 1891 and 1892.

Terminal charges may be divided into three classes:—

1. Station or depot terminals.
2. Service terminals.
3. Special terminals or charges.

While others, representing charges made for work at sidings and works, and the transhipment of merchandise owing to the difference in gauge of two systems forming a through route, as well as labour and cartage necessary to transhipment where two systems are not contiguous although running into the same town.

4. *Station Terminals.*—The maximum station terminal is the maximum charge which a company may make to a trader for the use of accommodation (other than the use of coal-drops) provided, and for the duties undertaken by the company for which no other provision is made in the schedule of rates and charges, at the terminal station for or in dealing with merchandise, as carriers thereof, before or after conveyance.

5. *Service Terminals.*—The maximum service terminals are the maximum charges which the company may make to a trader for the following services, when

rendered to or for a trader, that is to say, loading, unloading, covering and uncovering merchandise, which charges shall, in respect of each service, be deemed to include all charges for the provision by the company of labour, machinery, plant, stores and sheets. Provided that, where merchandise conveyed in a separate truck is loaded or unloaded elsewhere than in a shed or building of the company, the company may not charge to a trader any service terminal for the performance by the company of any of the said services, if the trader has requested the company to allow him to perform the service for himself.

6. *Special Terminals or Charges.*—A company may charge for the services hereunder mentioned, or any of them, when rendered to a trader at his request or for convenience, a reasonable sum, by way of addition to the tonnage rate. Any difference arising under this section is to be determined by an arbitrator appointed by the Board of Trade at the instance of *either* party.

(*a*) Services rendered by a company at or in connection with sidings not belonging to the company.

(*b*) The collection or delivery of merchandise outside the terminal station.

(*c*) Weighing merchandise.

(*d*) The detention of trucks, or the use or occupation of any accommodation, before or after conveyance, beyond such period as shall be reasonably necessary for enabling the company to deal with the merchandise as carriers thereof, or the consignor or consignee to give or take delivery thereof; or, in cases in which merchandise is

consigned to an address other than the terminal station, beyond a reasonable period from the time when notice has been delivered at such address that the merchandise has arrived at the terminal station for delivery. And services rendered in connection with such use and occupation.

(*e*) Loading or unloading, covering or uncovering merchandise is classes "A" and "B" of the railway companies' classification, which includes among other articles :—

Basic slag, chalk (rough for agricultural purposes), cinders, clay, coal, coke, culm, gravel, iron ore, ironstone, limestone, sand, stone, alabaster, blooms, billets or ingots of iron or steel, bricks, cement in slabs, compost, grains, furnace lamps, granite blocks, gypsum, iron and steel anvils, bars, ingots, scrap, buoy-sinkers, cannon ball and shot, and shells, ingot moulds, wire rope (old), lime, pig-iron, pipes, pitch, tiles, turnips, zinc ashes, zinc ore, etc.

(*f*) The use of coal drops.

(*g*) The provision by a company of accommodation at a water-side wharf, and special services rendered thereat by a company in respect of loading or unloading merchandise into or out of vessels or barges where no special charge is prescribed by Act of Parliament, provided that charges under this section shall not be deemed to be dock charges.

Other special charges which railway companies are also authorised to charge to the traders are for :

1. Wagon hire.
2. Transhipment.

As follows :—

Wagon Hire.—A company may charge for the use of trucks provided by them for the conveyance of merchandise, when the provision of trucks is not included in the maximum rate for conveyance (and this applies to all merchandise returned in class "A" of the general classification of merchandise issued under the Railway and Canal Traffic Act, 1888), any sums not exceeding the following:—

	Per cent. s.	d.
For distances exceeding 20 miles	0	4½
,, ,, ,, and not exceeding 50 miles . .	0	6
,, ,, 50 miles and not exceeding 75 miles . . .	0	9
,, ,, 75 miles and not exceeding 150 miles . . .	1	0
,, ,, 150 miles	1	3

Transhipment.—In respect of merchandise received from or delivered to another railway company, having a railway of a different gauge, the companies may make a reasonable charge for any service of transhipment performed by them, the amount of such charge to be determined in case of difference by an arbitrator to be appointed by the Board of Trade.

I think seeing it is now quite clear that tramways and light railways will be under the necessity of providing depots and the many facilities and appliances thereat for dealing satisfactorily with all descriptions of traffic both "smalls" and in bulk, it follows as a natural consequence that terminal charges for loading and unloading will not alone be sufficient to meet the case, but that it will be incumbent to have both classes of terminal charges, i.e. "station and "service" charges, in exactly

the same manner as is provided for by the railway companies under the "Railway and Canal Traffic Act" of 1888.

So far as Great Britain is concerned there appears to be nothing whatever to guide us to a proper conclusion in this matter, but on the other hand, Ireland, I think, furnishes us with all the information necessary.

On reference to the Irish "Railway Rates and Charges, (Athenry and Ennis Junction Railway) Order Confirmation Act, 1892," which includes the schedules of rates and charges applicable to the London and North Western (Irish Lines); the Midland Great Western Railway; the Belfast and Northern Counties Railway; the Great Southern and Western Railway, and in fact every standard railway in that country, it will further be found such Act includes, and the rates and charges recorded therein, are applicable to the following tramways and light railways, viz.:—

The Bessbrook & Newry Co. (electric).

The Castlederg & Victoria Bridge Tramway Co.

The Cavan, Leitrim & Roscommon Light Railway & Tramway Co.

The Cork & Muskerry Light Railway Co.

The Loughree & Attymon Light Railway Co.

The Mitchelstown & Fermoy Light Railway Co.

The Tralee & Dingle Light Railway or Tramway Co., etc.

These systems have adopted in its entirety the Railway General Classification of Merchandise, as issued by the Railway Clearing House, the full "station" and "service" terminal charges of the Irish Standard Railway Companies for General Merchandise and Live Stock,

and also the schedule of maximum rates for conveyance thereof.

Herein appears therefore to be the climax of the whole question: the Classification of Merchandise together with the schedule of rates and charges in each instance were drawn up and submitted to the Board of Trade according to the procedure laid down in the "Railway and Canal Traffic Act, 1888"; the same were approved just as in the case of standard railways by the Board of Trade, who afterwards embodied them in a Provisional Order, the same being ultimately confirmed by Act of Parliament at the instigation of the Board of Trade. Therefore to my mind it appears very probable the schedules of rates and charges as at present embodied in English Tramways and Light Railways Orders will not be allowed to pass so easily, but that the Board of Trade will step in as soon as the carriage of merchandise on tramways and light railways has developed to moderate extent, and require a somewhat similar procedure in this country to what has already taken place in Ireland, and will insist on the working of merchandise traffic on lines very similar those adopted by the railway companies. It would not further surprise the writer to find them endeavouring to introduce many of the restrictions now imposed on the latter, under the various "Regulations of Railways" Act, on tramways and light railways undertaking.

Under the Irish Railway Confirmation Rates and Charges Act, 1898, the schedules of Maximum Terminal and Conveyance Charges are as follow:—

MAXIMUM STATION AND SERVICE TERMINALS.

In respect of Merchandise Comprised in the under-mentioned Classes.	Maximum Terminals.				
	Station Terminal at each End, per ton.	Service Terminals.			
		Loading, per ton.	Unloading, per ton.	Covering, per ton.	Uncovering, per ton.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
A	0 3	..	..	..	..
B	0 6	..	..	..	..
C	1 0	0 3	0 3	0 1	0 1
1	1 6	0 5	0 5	0 1½	0 1½
2	1 6	0 8	0 8	0 2	0 2
3	1 6	1 0	1 0	0 2	0 2
4	1 6	1 4	1 4	0 3	0 3
5	1 6	1 6	1 8	0 4	0 4

MAXIMUM RATES FOR CONVEYANCE. MERCHANDISE AND MINERALS.

In respect of Merchandise comprised in the under-mentioned Classes.	Maximum Rates for Conveyance.			
	For Consignments except as otherwise provided in Schedule.			
	For the First 20 Miles, or any Part of such Distance, per ton per mile.	For the next 30 Miles, or any Part of such Distance, per ton per mile.	For the next 50 Miles, or any Part of such Distance, per ton per mile.	For the Remainder of the Distance, per ton per mile.
	d.	*d.*	*d.*	*d.*
A	1·40	0·90	0·70	0·50
B	1·50	1·15	0·80	0·55
C	1·95	1·50	1·20	0·70
1	2·40	2·05	1·65	1·45
2	2·70	2·30	2·00	1·55
3	3·10	2·75	2·45	2·05
4	3·65	3·30	3·05	2·40
5	4·30	3·90	3·80	3·00

Maximum "Station" and "Service" Terminals, and Maximum Rates for Conveyance of Live Stock Traffic.

The following scale is applicable to the railway companies, and tramway and light railway companies, provided for in the Irish Railway Rates and Charges Order Confirmation Act of 1892, referred to above.

Description.	Rates for Conveyance per Mile.				Station Terminal at each End.		Service Terminals.				Minimum Total Charge per Consignment.	
	For the First 20 Miles or any Part of such Distance.	For the next 30 Miles or any Part of such Distance.	For the next 50 Miles or any Part of such Distance.	For the Remainder of the Distance.			Loading.		Unloading.			
	d.	*d.*	*d.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
1. For every horse, mule or other beast of draught or burden	3	3	1·65	1·65	0	6	0	4	0	4	2	6
2. For every ox, cow, bull or head of neat cattle . .	2	2	1·30	1·30	0	4	0	3	0	3	2	6
3. For every calf not exceeding twelve months old, pig, sheep, lamb or other small animal . . .	0·75	0·75	0·40	0·35	0	2	0	1½	0	1½	2	6
4. For every animal of the several classes above enumerated conveyed in a separate carriage, by direction of the consignor, or from necessity.	6	6	6	6	1	6	1	0	1	0	5	0
5. For any truck of not less than 13 feet 2 inches, and not exceeding 15 feet 2 inches in length inside measurement, containing any consignment by the same person of such number of oxen, cows, neat cattle, calves, sheep, goats or pigs as may reasonably be carried therein . . .	7	6	5·20	4·50	1	0	1	0	0	6	5	0
6. For any truck exceeding 15 feet 2 inches and not exceeding 16 feet in length inside measurement, containing any consignment by the same person of such number of oxen, cows, neat cattle, calves, sheep, goats or pigs, as may reasonably be carried therein	8	7	6·20	5·50	1	0	0	9	0	9	5	0

CARRIAGES. SCALE OF TERMINAL CHARGES AND MAXIMUM RATES FOR CONVEYANCE.

This part of the maximum rates and charges is common to all Railway Rates and Charges Orders Confirmation Acts of 1891 and 1892, and not to any one section of the United Kingdom of Great Britain and Ireland alone.

Description.	Rates for Conveyance per Mile.				Station Terminal at each End.	Service Terminals.		
	For the first 20 Miles or any Part of such Distance.	For the next 30 Miles or any Part of such Distance.	For the next 50 Miles or any Part of such Distance.	For the Remainder of the Distance.		Loading.	Unloading.	
	d.	*d.*	*d.*	*d.*	*s. d.*	*s. d.*	*s. d.*	
For every carriage of whatever description not included in the classification, and not being a carriage adapted and used for travelling on a railway, and not weighing more one ton, carried or conveyed on a truck or platform	6	6	3·30	3·20	1 0	0 6	0 6	..
For every additional quarter of a ton which such carriage may weigh	2	2	1·35	1·25	..	..	..	..
For the use of a covered carriage truck for the conveyance of any such carriage . .	An additional charge of 10*s.*							

The terminal charges other than those payable under paragraph 4 on animals sent by the same person at a

rate calculated per head, and carried in the same truck, shall in no case exceed the terminal charges per truck.

Where the company is required to cleanse and does cleanse trucks under the provision of any Order in Council, or duly authorised regulation of any Department of State, they may make a charge not exceeding one shilling per truck in addition to the charges herein authorised.

Seeing that frequent disputes have arisen between traders and the various railway companies in regard to the term "terminal station" and the charges that may be made thereat, it would perhaps, in conclusion, be well to quote the Board of Trade definition, which is as follows.

"The term 'terminal station,' means a station or place upon the railway, at which a consignment of merchandise is loaded or unloaded before or after conveyance on the railway, but does not include any station or junction at which the merchandise in respect of which any terminal is charged has been exchanged with, handed over to, or received from any other railway and a siding let by or not belonging to the company, or in respect of merchandise passing to or from such siding any station with which such siding may be connected, or any dock or shipping place the charges for the use of which are regulated by Act of Parliament.

"The term 'siding' includes branch railways not belonging to a railway company."

Mr. Upton, in these excellent and timely articles, has, in reality, only opened the door to what the electric tramways and light railways will find a tremendous and complicated undertaking—i.e. goods traffic.

It may be stated at the outset that passenger traffic is simplicity itself compared with the problem of goods traffic. For this reason, and also because the electric tramways and light railways (in this country) have had (up to the present time) practically no experience in this branch, it would be advisable to benefit by the hard-earned experience of successful railway companies, and, wherever practicable, work on similar lines—unless, of course, improved systems of organisation and simplicity of working suggest themselves and prove practicable.

The fact that the goods will be conveyed by a different motive power (electricity) instead of by steam railroads, will not necessarily revolutionise the method of organisation as regards the goods traffic problem.

Tramway managers and others must not overlook the fact that it has taken the railway companies of this country a great number of years to arrive at the practical and commercial solution of the complicated problem of goods traffic.

It is extremely difficult at present to see whereby the method of organisation, or the handling of goods traffic, on electric tramways and light railways will depart from the broad underlying principles adopted by large railway companies ; of course, minor details may be altered, and suggested and found workable.

The fact must not be lost sight of that the Railway

Companies of Great Britain have, without doubt, what is recognised as the most perfect organisation and system of goods traffic in the world. There is, at present, another reason why the railway organisation will have to be adopted and worked on similar lines by the tramways and light railways—viz. they will, for some time to come, only play the part of feeders to the railway companies. Under such circumstances they will have to work in harmony with them, and, of course, adopt their well defined and practicable methods.

It is neither sense nor reason to expect that large railway companies will depart from their satisfactory methods of organisation, etc.—the present state of perfection of which has only been attained by hard bought, and expensive experience, etc.—to try and fall in with some experimental, and highly probable unworkable, methods which may be suggested as regards the handling of goods traffic by electric tramways and light railways.

Herein lies one of the greatest advantages which it is possible to imagine for the benefit of tramways and light railways, which consists in the fact that the large railway companies of this country have already paid for the experience, etc., as regards the handling of goods and the organisation necessary for their successful manipulation.

The importance of this advantage cannot be overestimated. Electric tramway and light railway companies and syndicates, are now in a position whereby they can either start in right and work towards a successful issue, both practically and commercially, by

using common sense and adopting well-tried and successful methods as regards organisation of goods traffic, etc.; working in harmony with the railway companies and thus avoiding knotty, complicated and expensive problems; or, they can do otherwise, which consists in trying impracticable methods, paying for their experience, and being thrown back years in what ought to be a rapid and steady development for the benefit of the community, land and country at large.

The fact must not be overlooked that the railway companies have well-defined laws granted by Act of Parliament, classification of goods, traffic rates, etc., which laws, classifications and rates have from time to time been altered to suit improved conditions. Now, owing to the fact that electric tramways and light railways are practically in the embryo state, it is not reasonable to expect that they have such well-defined laws, classifications, etc., to work upon.

However, at present they are certainly under a disadvantage as regards this.

By that I mean, that the classification of goods and the traffic rates are not on the same basis on both systems, with the inevitable result that when the railway and tramway and light railway companies begin working together, as regards the interchange and through traffic of goods, troubles and complications will arise, which will not be easily settled, and will result in expensive litigation, lawsuits, etc.

It is no use whatsoever for the two systems to be

working except they work in harmonious combination this will be beneficial to both parties.

There is certainly one fundamental principle which will have to be settled sooner or later, to bring about this simplicity of working in harmonious combination, and that is for the Board of Trade to place both systems on an exactly similar and equal basis as regards the classification of goods, traffic rates, laws, etc. This, in a nutshell, is the key to the situation, providing both systems desire harmonious combination and relations—which will be to their own commercial benefit and for the good of the community, land, and country at large.

With the above idea in view, the author suggests that a conference should be held between those interested in the railway and tramway and light railway world—they should approach the Board of Trade, and get this point settled.

When this is done, it is an easy proposition for the two systems to mutually arrange terms as regards through rates, etc., when all would pass through that ideal working organisation, viz. the Railway Clearing House.

There are on the railways hundreds of distributing centres for goods traffic ; and the electric tramways and light railways, in addition to being feeders to the railway companies to supply these centres, will in great probability open out different parts of the country (where there are now no railways), and therefore will have to adopt large distributing centres of their own.

For the information of those tramway managers and

others who are not practically well-versed in the handling and organisation of goods traffic, and whose systems intend to go deeply into this complicated problem, it may not be out of place here to give some outline details of the methods of working on railways. As before stated, practically the same methods will be adopted on electric systems; there may, of course, be slight modifications as regards details, but the broad lines of working will undoubtedly be similar.

The author cannot do better than take some extracts from that excellent work on the 'Working and Management of an English Railway,' by the late Sir George Findlay. As regards the working of goods stations, he goes on to say:—

"To the uninitiated, it may possibly appear that when a package or a consignment of merchandise is handed to a railway company for transit, it is a very simple operation to place it in a wagon and convey it to its destination; but it is only necessary to bear in mind the vast extent of the operations carried on at a large and important goods station, the multitude of consignments that have to be simultaneously dealt with, their varied description and the many destinations to which they have to be conveyed, in order to realise that to enable a vast business of this kind to be conducted with promptitude and certainty, to provide securities against goods being mis-sent or wrongly delivered, and to ensure a reliable means of tracing them in the event of their, after all, going astray, a most complete and careful system of organisation is indispensable.

"It may be premised that the methods and appliances employed by different railway companies as a means of securing these results, are not precisely identical in practice, nor are they absolutely uniform at all the stations of one company, it being frequently necessary to be guided by physical circumstances, the mode of construction of the premises, and the special nature of the traffic at particular stations, but from a description of the mode of working certain of the goods depots on the London and North Western Railway, the reader will be able to gather a fair idea of the nature of the operations to be carried on in working a large merchandise traffic, and of the arrangements which, with more or less variation, are adopted at the most important goods stations.

"A goods station which possesses certain features of interest, chiefly on account of its somewhat unique mode of construction, is Broad Street, which is the City depot of the London and North Western Company in London.

"The North London Railway, which is connected with the North Western, passes round the northern suburbs of London to Dalston Junction, where it trends almost due south to its passenger terminus at Broad Street in the very heart of the City.

"Land in the City of London being, of course, extremely valuable, the line is carried during the latter part of its course by means of bridges and viaducts at a high elevation, in some cases over the tops of the houses and it thus reaches its terminus at a point considerably

above the level of the surrounding thoroughfares, the passenger station having accordingly been built on arches.

"Advantage has been taken of this fact to enable the London and North Western Company to provide themselves with an extensive goods station without incurring the enormous expense of taking land for the purpose in the busiest part of the city, and the goods traffic is, as a matter of fact, conducted in the arches under the passenger station, the wagons of goods being transferred one by one from the upper to the lower level, and *vice versâ*, by means of powerful hydraulic lifts.

"All along the front of these arches, which are fourteen in number, and, including some space beyond them which has been covered in, each measure 340 feet in length and 32 feet in width, a roomy stage or unloading bank has been erected, 430 feet long and 45 feet deep, and from this, at right angles, narrow stages, 240 feet in length and 12 feet in width, with a line of rails on each side of them, extend through each arch; the lines of rails being at the further end connected with a cross-line, by means of which the wagons can be turned upon turn-tables and taken to one or other of the hydraulic hoists, each of which will raise a weight of fourteen tons.

"On the further side of the arches, some additional space has been taken in on the street level to form an open goods yard, on one portion of which a lofty warehouse has been erected, for the storage of goods waiting delivery or goods for forward transit.

"Before attempting to describe the manner in which

this station is worked, it is necessary to explain that traffic arriving from the country for delivery in London is called 'up traffic," while 'down traffic' means traffic sent from London to the country, and these two elements in the business of the station are in practice kept perfectly distinct.

"The inwards or 'up' traffic at Broad Street, consists very largely of provisions for supplying the early markets with fish, meat, poultry, butter, eggs, and other perishable commodities, which have to be delivered in time for sale to the retail buyers who attend the markets as early as four o'clock in the morning; and also of general merchandise, purchased from manufacturers in the provinces one day, and expected to be in the City warehouses by nine o'clock on the following morning; and to effect deliveries at such an early hour is a work which demands for its accomplishment the most perfect organisation and attention to detail.

"The mode of dealing with the 'up' goods is as follows. This part of the business is conducted, not in the arches previously described, but in the warehouse of which mention has already been made, the ground floor of which is staged so as to form a deck, or platform, upon which the goods can be sorted and transferred from the railway wagons to the street vans.

"This platform is open on both sides, so that vans can be backed up to it on one side, while a line of rails extends along the other side, on which the railway wagons on arrival are placed, after being lowered from the upper level by means of the hydraulic hoists.

"The invoices which are received with the wagons, and which are documents containing a description of the goods, their marks and addresses, the weight and particulars of the charges are passed into an office called the delivery office where each invoice is entered in a book, stamped with a progressive number, timed as to arrival, checked as to correctness of rate and charges, and is there passed to a 'marking clerk,' whose duty it is to mark against each entry on the invoice the position on the platform, or sorting bank, in which the article to which the entry refers is to be placed.

"On the platform, by means of letters and numbers painted on the columns which support the roof, the whole of London is mapped out into districts with great care and precision; and the numbers inserted by the marking clerk on the invoice correspond with these divisions, and are for the guidance of the checkers in unloading the goods from the wagons, and loading them into the vans for delivery.

"The marking clerk having discharged his office, the invoice passes on to another set of clerks, each of whom extracts from it, and enters on the carman's delivery sheets, such of the entries as refer to the particular section of the City with which he is appointed to deal; and by this process of exhaustion, the whole of the entries for delivery to a particular district are brought to a focus, although the goods may have arrived from hundreds of different stations, and be entered on as many different invoices.

"The same set of clerks enter the charges in the

carman's delivery sheets in cases where they are to be paid by the consignees.

"The next step is to pass the invoice out of the delivery office to the platform, where a gang of men unload the goods from the wagons, checking them with the invoice as they do so, and wheel them away on hand-trucks to the different positions on the platform, according to the numbers marked against the entries.

"Next, the carman's delivery sheets are passed out to the platform, and the delivery foreman directs the loading of the vans from the different sections on the bank, the goods being carefully checked against the entries on the delivery sheets as they are placed in the vans.

"Finally, the cartage department takes possession of both vans and delivery sheets, the vans are horsed and started away to their respective destinations, all the processes being carried out with the utmost care, but at the same time with the greatest rapidity.

"There are, however, many contingencies which arise in the working of the traffic, and must be promptly met in order to prevent delays occurring, and the chief of these may be classed under four heads, as follows: (1) Goods arriving without invoice; (2) Discrepancies between the invoice and the goods actually received in the wagons; (3) Invoices arriving without the goods and (4) Goods accidentally trucked to the wrong position on the platform.

"If the wagon arrives without invoice it is unloaded in its turn, an account of the goods contained in it is

entered on a special form provided for the purpose, and where the addresses of the consignees appear on the goods, they are trucked away to their proper position on the platform, the number of the section being marked on the form by the checker.

"The form is then passed into the delivery office, and as far as possible delivery sheets are made out from it in the same way, as if it were the missing invoice.

"Such goods as are found in the wagon merely under mark, and not addressed, are taken to a particular position on the platform, to wait further orders on the arrival of the invoice.

"Meanwhile, the sending station is applied to for a copy of the invoice, and the goods which remain on hand are dealt with on its arrival. A similar course is adopted in the case of goods found in a wagon without there being any corresponding entry on the invoice.

"When the invoice arrives, but not the goods, which usually results either from the wagons having been wrongly labelled, or having missed their proper train, the telegraph is set to work to ascertain their whereabouts, and the invoices are held over until the goods make their appearance.

"The most troublesome errors arise from the porters misunderstanding the directions given by the checkers, and wheeling goods to a wrong section on the platform.

"In a case of this kind when the delivery sheet for that section arrives from the office, it of course contains no entry of this particular package, and it is consequently left on the bank.

"On the other hand, the checker for the section to which it should have been taken finds he is short of it, and makes a remark to that effect on the sheet which he passes back to his foreman, and the latter employs every means in his power to discover the whereabouts of the missing package.

"Failing to do so, he calls in the services of two men, who are called 'searchers,' and are employed upon this duty all day; but if their efforts prove fruitless, there is nothing for it but to wait until the 'bank list' is taken, that is, when at four o'clock each afternoon a complete list is made of all goods remaining on the bank after the morning's deliveries, by means of which most errors can be rectified.

"The 'down' or outward traffic is dealt with in the arches before described, the 'runs' or lines of rails alongside the stages being gradually filled during the day with rows of empty wagons, ready to receive the goods as they come in during the afternoon and evening.

"This is effected by transferring to the 'down' arches the wagons which have come in with 'up' goods and have been emptied during the morning. As the loaded vans come in at the gates they are stopped at an office placed at the entrance, called the 'weighbridge office,' and the consignment notes are impressed with an official stamp, which alone renders them authentic.

"The consignment note plays an important part in the manipulation of the outward goods, and it may be explained, for the benefit of the uninitiated, that it is a document which the sender of goods hands to the carman,

or other agent of the company, to whom he delivers the goods, and in which is described their nature, their marks, and addresses, and sometimes their weight.

"Business firms who are in the habit of forwarding goods, use for this purpose printed forms supplied by the company or provided by themselves; but where ordinary members of the general public forward isolated packages without a consignment note, the company manufacture one from the address, or the entry in the carman's book, the principle acted upon being that there must be a separate consignment note provided for every distinct package or parcel of goods for the same destination.

"The object of stamping the consignment notes at the entrance gates is to checkmate a very ingenious system of fraud which was found to be in operation some time ago, when some dishonest servants of the company hit upon the plan of obtaining possession of valuable goods by simply destroying the original consignment notes and addresses and substituting false documents, by which the goods were consigned to confederates in some other town.

"Under the present system, as the fraudulent note could not bear the weighbridge stamp its character would at once be detected.

"Large firms frequently enter a whole van load of goods for various addresses on one consignment note, and therefore the first step is for all such notes, containing more than one entry, to be taken to an office called the 'shipping office,' where a separate note is

made out for each separate consignment; these manufactured notes being officially stamped to show that they are 'extracted' from an authentic note.

"Meanwhile, the vans as they arrive are placed in position for unloading on to the large stage or platform, previously described as running along the front of all the arches; the consignment notes relating to each load are handed by the unloading foreman to the various checkers who are in charge of the unloading gangs, and the goods are removed from the vans, checked against the entries on the consignment notes, and weighed on the weighing machines, which are stationed at regular intervals all along the stage.

"On the wall in each of the arches is painted a number, and the name of the place or district for which goods are loaded in that particular arch; for instance, one will be 'Liverpool,' another 'Manchester,' a third 'North Staffordshire,' and so on, and in each arch also there is displayed a copy of a table, corrected from time to time, and which shows in more detail the stations to which goods are loaded in each arch, and the times of departure of the trains made up and despatched each night to the various destinations.

"The experienced checker, however, has all this in his head, so that when a package is taken out of a van, and the marks or address is called out, he is able at once to check the entry on the consignment note and to shout 'No. 5' or 'No. 6' as the case may be, when the package is forthwith placed on a hand-truck, and, accompanied by its consignment note, is wheeled away to the particular

arch to which it belongs, and deposited on the stage there ready for loading into the wagons.

"Here, one of the loading gangs, each of which consists of a checker, a loader, a caller-off and two porters, take it in hand, and deposit it in a wagon destined for the station to which it is addressed.

"When the goods are in the wagons, the consignment notes are taken to the shipping office, and the clerk in charge sorts them out to the different clerks whose duty it is to make out the invoices for the various destinations.

"These clerks enter on the invoices the names and addresses of consignees, the nature and description of the goods, the weight and the charges; and the invoices, if they are ready in time, are handed to the brakesman in charge of the train by which the waggons are despatched; if not ready at the time the train departs, they are sent afterwards by fast passenger trains, so as to arrive at the same time as the goods, or before.

"The consignment notes, having been marked with a progressive number in such a way as to identify them with the corresponding entries on the invoices, so as to facilitate the tracing of goods which may go astray, are carefully filed for future reference.

"The wagons of goods when loaded, sheeted and labelled, are run out at the further end of the arches, turned on to the hydraulic hoists by means of the turntables and capstans, and emerge on to the upper levels, where, in a group of ten long sidings adjoining the North London Railway, and still by the aid of hydraulic

capstans, they are marshalled into trains and sent away to their various destinations.

"This process is, however, very much facilitated beforehand by the fact that the wagons have been arranged in the runs or arches in 'train order,' i.e. a separate train or portion of a train has been loaded in each arch and in 'station order,' so that the wagons emerge from the lifts on the high level in the order in which they are required to go away.

"Goods intended for large centres such as Liverpool, Manchester, etc., to which many wagons are loaded on the same night, are dealt with in two of the arches which are laid out in a somewhat different manner from the rest.

"In these arches there is a roadway for carts throughout, and the goods are loaded direct from the carts to the railway wagons, without any hand-trucking being needed.

"If, through extra pressure, or by oversight, goods are left on the stages when the loads have been made up and the night's work is over, the consignment notes found with them are taken into the shipping office and stamped with a letter 'S' (stage), to indicate that the goods have been left over, and that special attention must be given to their despatch by the first available train.

"When goods are found left on the stage, without consignment notes, if the names and addresses of consignees are apparent, they are entered on new consignment notes and dealt with in the usual way.

"If, on the other hand, there is nothing to indicate their destination, they are kept on hand and a record of the fact is made in a book set apart for the purpose, and which is referred to whenever there is an enquiry with regard to goods not delivered; every available means being meanwhile taken to discover the owners, by a number of clerks specially employed on this duty."

The above clear description sets forth the method of organisation and working of a goods station. In the author's opinion, the underlying broad principles of this systematical organisation cannot, with advantage, be departed from, in the handling of goods traffic by electric tramways and light railways. Minor details and improvements may possibly be tried and adopted; at any rate for the present, it would be highly advisable to work on similar lines as the railway companies. This will prevent complications which would, no doubt, occur, provided new and untried methods were experimented with.

It is certain in the near future, that the goods will be collected and distributed by motor lorries, vans and vehicles in general, in preference to the use of horse haulage; and, in the author's opinion, motor haulage will eventually prove more speedy and economical.

The secret of the handling and organisation (from a commercial standpoint) of an extensive goods traffic is to prevent the rolling stock from coming back empty, or, in other words, minus goods on the return journey.

COMPETITION AND COMBINATION.

It will be a wise policy for electric tramways and light railways to avoid by all means the commercially disastrous, foolish and suicidal policy of reckless competition with railroads; they should not adopt the policy of "Business at any price rather than no business at all." This is the policy adopted by an undertaking who are courting financial disaster and ruin, and generally ends up in bankruptcy.

Of course, healthy competition in reason, may prove commercially beneficial under certain conditions, but these conditions are very limited.

In the "cutting of rates" by rival railroads, the stage of "reasonable competition" is soon passed; and the competition between railroads when once they start on a "rate-cutting war," finds no natural limits.

Electric tramways and light railways in this country have had no experience in such problems; and here, again, attention may be drawn to the great advantage they have, in being able to profit by the experience of other undertakings working on similar lines.

Competition for business has been tried time and time again by rival railroads in every country, and always ends either in bankruptcy, ruin, or financial losses or embarrassments for one or more of the parties involved in the fight.

The weakest generally goes to the wall, and the survivor has found it a losing game.

When rival railroads once start in with the avowed object of getting business by competition, their recklessness finds no limit, and generally ends up in dismal failure financially.

Electric tramways and light railways, if constructed in different parts of the country where favourable opportunities for land developments and other advantageous conditions exist, will find that they can build up an extensive and profitable business, which with proper management will undoubtedly be a commercial success, without having to resort to competitive methods; the trade thus obtained being generally carried at a financial loss.

Some electrical systems will, no doubt, be so placed, favourably, as regards cheap production of power, economical running and other conditions, that they could carry goods at a much lower rate (with a profit), than existing railroad rates and rates allowable to light railways, etc.

Now within a local area, where the goods would be collected and delivered by them, and confined entirely to their handling, and in that area or district they could no doubt be carried with a profit at a comparatively low rate; but where the goods are carried on the light railway and then transhipped to other systems and railroad companies to be carried to their destination, it becomes absolutely necessary to have some uniform charge, whereby all interested parties get their proper share of the proceeds with a reasonable profit.

There is, then, only one course open to approach

ideal conditions, and that is to work in harmonious combination with the existing railroads.

Acts of Parliament should so adjust the rates for merchandise and goods that the different systems should be on an equal footing, this would tend to simplify working conditions and prevent complications.

It may not be out of place here, to draw attention to the great importance of adopting a uniform standard "gauge" (viz. 4 feet 8½ inches) for all railway permanent-way construction.

There have been different systems constructed to various gauges, and at the present time a number of light railways under contemplation with an adopted gauge of 3 feet 6 inches on account of being less expensive to construct than a 4 feet 8½ inches gauge.

There is a great disadvantage in these various gauges, and that is, because there can be no "interchange" of rolling stock from one system to another, which, when goods have to be carried from one place to another, involves the necessity of re-transhipment and rehandling of goods, with its increased expenditure, delays, etc.

This is, without doubt, one of the greatest mistakes now being made by various authorities and engineers, which will have a great bearing in the future as regards the development of electric tramways and light railways.

Another mistake which has been made is, in the distance apart between "double tracks;" this should be uniform, as well as a standard uniform gauge.

The Board of Trade requirements state, that there

must be a certain clearance distance between the sides of passing "cars" or "rolling stock"; this determines the "overhang" of the car which can be adopted under that particular condition where a certain distance apart of a "double track" exists.

Now, where running powers over each other's lines exist between different systems, it may be that although the track gauges are similar, still the distance apart of the "double track" is different; the system whose distance apart of the track is say 5 feet will in all probability have a greater "overhang" of car than one whose system is say 4 feet, with the result that although the cars from the 4 feet system can run over the lines of the 5-feet system, still the cars from the 5-feet system cannot run over the lines from the 4-feet system, because the "overhang" of the cars and rolling stock is too great, preventing the minimum clearance allowable by Act of Parliament.

What is essential and important is a uniform gauge, uniform distance apart of "double track" and a uniform "overhang" of "cars" and "rolling stock." This simplifies matters, and readily allows an "interchange" of rolling stock.

Generally speaking, competition is the effort of rival sellers to secure a market for their goods, each striving to offer better terms than his competitors. Competition is what prevents any individual from fixing prices to suit himself, because his rivals will give lower prices, and he will get no business at all.

Competition applied to railroads is the cutting of traffic rates to obtain business.

There is a marked difference of principle between mercantile competition and the competition of railroads. In the former case its action is prompt and healthful, and generally does not go to extremes.

If grocer "A" sells goods below cost, grocer "B" need not follow him, but simply stop selling for the time. For: (1) This involves no great present loss to "B"; when his receipts stop, most of his expenses stop also. (2) It does involve a present loss to "A"; if he is selling below cost, he loses more money the more business he does. (3) It cannot continue indefinitely. If "A" returns to paying prices, "B" can again compete; if "A" continues to do business at a loss, he will become bankrupt, and "B" will find the field clear again.

But if railroad "A" reduces charges on competitive business, railroad "B" must follow. (1) It involves a great present loss to stop. If a railroad's business shrinks to almost nothing, a large part of its expenses run on just the same. Interest charges accumulate; office expenses cannot be suddenly contracted; repairs do not stop when traffic shrinks; for they are rendered necessary by weather as well as by wear. (2) If "B" abandons the business, "A's" reduction of rates will prove no loss. The expense of a large business is proportionally less than that of a small one. A rate which was below cost on 100,000 tons may be a paying one on 200,000. (3) Profitable or not, "A's" competition may be kept up indefinitely. The property may go into bankruptcy, but the railroad stays where it is. It only becomes a more reckless and irresponsible competitor.

Mercantile competition finds a natural limit. It brings rates down near to cost of service, and then stops. The competition of railroads finds no such natural limit. Wherever there is a large permanent investment, and large fixed charges, competition brings rates down below cost of service.

The competitive business gives no money to pay repairs or interest. Sometimes the money to pay for these things comes out of the pockets of other customers, who do not enjoy the benefit of the competition, and are charged much higher rates. Then we have the worst forms of discrimination.

Sometimes the money cannot be obtained from any customers at all. Then we have bankruptcy, ruin to the investor, and—when these things happen on a large scale—a commercial crisis.

There is but one way to prevent these results. If competition is ruinous to all parties, all parties must stop competing. If it finds no natural limit, it must be artificially limited; it must end in combination.

This combination may take any one of four forms: (1) Agreement to maintain rates; (2) To divide the field; (3) To divide the traffic; (4) To divide the earnings. The last three are commonly known as pools.

The first is the simplest, but least effective. There is scarcely an organised industry where the dealers do not meet and settle upon a schedule of rates and discounts, agreeing that no one shall sell below these prices.

Such agreements are rarely kept. It is for the interest of all that rates in general should be maintained;

but it is for the interest of each concern to secure business for itself, by not quite maintaining them.

This constitutes a great temptation to depart from schedule prices; a temptation all the stronger because it is so easy to violate the agreement indirectly, and so hard to detect any such violation.

The result is apt to be a system of underhand competition, worse in many respects than the open competition which existed before there was any agreement at all.

This is why it is found necessary to divide the business among the different competitors by a pooling agreement. Such agreements are hard to arrange. There is almost always a dispute about their terms.

When it is possible to "divide the field" this course is usually the simplest. The fourth and closest form of combination is, where there is a "division of earnings."

The machinery for securing this division may have any degree of organisation up to the point of actual consolidation of the competing interests.

In cases where traffic, in being conveyed from its starting point to its destination, has to be carried over the railways of two or more companies, the receipts are divided between the companies concerned in proportion to the mileage travelled over each railway.

In the case of merchandise traffic, before this division is made a certain fixed sum is allowed (according to the nature of the traffic) to the forwarding and receiving companies respectively, for terminal expenses—that is to say, for the use of stations and for the services of loading and unloading and clerkship.

A simple illustration will perhaps best serve to show the working of this arrangement.

We will suppose that a ton of goods has to be forwarded a distance of a hundred miles, and in completing its journey has to travel sixty miles over one railway (A), and forty miles over another (B). We will assume that the freight amounts to 23*s.*, and that the terminal allowance at each end is 4*s.*

Company A will receive—

$$\frac{60}{100} \text{ of } 15s. = 9s. + 4s. = 13s.$$

Company B will receive—

$$\frac{40}{100} \text{ of } 15s. = 6s. + 4s. = 10s.$$

Total . . 23*s.*

The question of division of traffic brings us to the consideration of one of the most important features of the railway system, which is known as the "Railway Clearing-house."

RAILWAY CLEARING-HOUSE.

This is not a judicial, nor, in the ordinary sense of the word, an executive body. It decides no disputed questions; it makes no rates. It is an incorporated body; but this is only to give greater responsibility to its work. It is simply a highly organised machine for keeping and settling traffic accounts.

In the early days, when railways began to mul-

tiply and to run in connection one with another, it was necessary for a passenger who had to travel over two railways before his journey was completed, to change carriages on the termination of the first one and to take a fresh ticket; and similarly, every consignment of merchandise had to be transhipped from one company's wagon to that of another at the point of junction, and to be re-invoiced.

As the business increased, this was soon found to be a perfectly intolerable system, and a demand arose from the public that they should be enabled to travel between any two points by paying the fare for the whole journey at the place of departure; and that, in the same way, merchandise and live stock should be forwarded throughout, without sustaining the delay and possible damage involved in frequent transhipments.

The difficulty to be overcome in giving effect to this demand was two-fold; for not only would one company be receiving money, part of which was due to another company, but each would be obtaining a service from the carriages and wagons of the other, for which, clearly, some payment must be made.

For a time the companies attempted to meet the case by a system of keeping accounts and exchanging returns of the receipts of each from through traffic; but this plan was open to many objections.

Different companies had different modes of keeping their accounts, and no one had any authority to impose uniformity; so that there were mutual difficulties in agreeing the figures, and the consequent disputes en-

gendered ill-feeling, recriminations and charges of unfair practice.

This brought about the establishment of the "Railway Clearing-house"; since the year 1850, its proceedings have been regulated by Act of Parliament (13 and 14 Vic., cap. 33), and its authorised functions are thus defined: "To settle and adjust the receipts arising from railway traffic within, or partly within, the United Kingdom, booked or invoiced, at throughout rates or fares."

The management is conducted by a committee of delegates, appointed by the boards of the several railway companies, parties to the system; each company, however great or small, having the power to appoint one delegate, and the expenses being borne by the companies in the ratio of the amount of business done on their behalf.

Any railway company not a party to the clearing system may apply under seal for admission; and, if the committee of delegates assent to the application, the company is at once received on an equal footing with all the other companies already parties to the system.

Any company may withdraw at will by giving one month's notice under seal, or a company may be expelled by the vote of two-thirds of the delegates present at a meeting specially convened for the purpose.

The committee meets four times a year, or oftener if needful, and its chairman is elected annually, but is eligible for re-election indefinitely. Its permanent officers are a secretary and treasurer.

The accounts are made up, not between each com-

pany and the clearing-house as a whole, but between each separate group of two or more companies.

There are two reasons for this: first, in order that a special disagreement between two companies may not interfere with the whole system of accounts; and second, in order that special expenses may be charged where they belong.

The accounts of the clearing system, and the balances due to and from the several companies, are settled and adjusted by the secretary, who also determines the amount to be from time to time contributed to the funds of the clearing-house by each company.

In case of any difference arising with respect to the accounts, the decision of the Committee that a certain balance is due and payable by a particular company is final and conclusive; and such balance is recoverable in a court of law, upon simple proof that the Committee have declared the amount to be payable.

In earlier days, the operations of the clearing-house were limited to dealing with passenger and parcel traffic, and the mileage and demurrage charges for the use or detention of carriages, wagons and sheets, when travelling upon railways other than those belonging to the owners of the stock; but since the year 1847 the system has been extended to merchandise and live stock traffic, including a considerable proportion of the through coal traffic.

The general principle upon which the receipts arising from through traffic are apportioned between railway companies has already been described; but two or more

companies frequently enter into agreements, for special modes of division of certain traffic, and the clearing-house gives effect to these on receiving "joint instructions" mutually agreed between the companies concerned, the system being sufficiently elastic to meet every kind of agreement that can be devised for the apportionment of traffic receipts.

In any case in which one company claims a larger share of the receipts from a particular traffic than its partners are prepared to concede, the clearing-house reserves, in making the apportionment, a sufficient amount to meet the claim, until the difficulty can be adjusted by agreement, arbitration or otherwise, and amounts thus reserved are said to be in "suspense."

Having described the results achieved by this admirable organisation, it may be worth while to glance briefly at the machinery by which those results are attained.

In the first place, the clearing-house has accounts from the stations of all through passenger tickets issued; and these accounts are corroborated by the last ticket issued each month between given points being forwarded to the clearing-house, so that if a passenger travels from London to Inverness he pays the full fare at London and the clearing-house takes care that the Caledonian and Highland Companies are credited with their proper share of the receipts.

A similar course is adopted with regard to the invoices of merchandise traffic, accounts being sent in by the receiving, as well as the forwarding stations; and, in

addition to this, every station makes a return to the clearing-house of all parcels booked through, and of carriages and wagons, either loaded or empty, received and despatched.

Then, scattered all over the country, at every junction of two railways, the clearing-house have number-takers stationed, who record the numbers and description of every vehicle that passes a junction going from one line to another, and these men forward returns to the head office in London.

All these returns are examined, analysed and checked, one with another; and thus, with enormous labour, but with the most marvellous accuracy, the accounts are made up and the balances declared.

The advantages of such an institution as this, which has had such great results in facilitating intercourse and the trade of the country, can hardly be over-estimated, for it is only by means of this system that the produce of remote districts has been brought to the door of the consumer; while, as for Ireland, if the facilities thus afforded for her cattle, poultry, butter and eggs to command the English markets had not existed, it is certain that the social conditions of her people must have been much worse than it is.

The clearing-house, however, discharges other functions besides the division of traffic receipts and the adjustment of mileage and demurrage accounts.

It affords a convenient neutral ground where the various companies, whatever their conflicting interests or differences of policy, can meet on friendly terms, can

agree upon measures of concerted action, and afford one another the benefit of their mutual experience in devising measures for the common good.

Three important conferences are held at the clearing-house every three months, one attended by the general managers of the different companies, another by the goods managers, and a third by the passenger superintendents; all these dealing with the subjects specially germane to their respective departments.

Thus, the goods managers' conference deals with such questions as the charges for the use of wagons, the classification of goods traffic, terminal allowances, etc.; the superintendents' conference deals with the speed and signalling of trains, rules and regulations for the working of railways, the block telegraph system, excursion trains, and subjects of like nature; the general managers' conference reviews the recommendations of the goods managers and superintendents, and, in its turn, frames proposals to be submitted to the committee of delegates for adoption by the companies.

To the clearing-house is also entrusted the apportionment of the gross amounts accruing to the railway companies under the Post Office (Parcels) Act of 1882, in remuneration for their services in conveying the parcels mails from station to station within the United Kingdom.

This apportionment is made half-yearly in ratio to the receipts of the various companies from parcels traffic proper; interim distributions, based on their parcels receipts for the corresponding half of the previous year,

being meanwhile made of the sums received quarterly from the Post Office.

For the purpose of the apportionment, the companies render to the clearing-house certified monthly returns of their receipts from local parcels traffic, and these are supplemented with their earnings from through traffic, as ascertained from the clearing-house accounts. The clearing-house, also, as representing the railway companies, undertakes the auditing of the parcel post accounts of the Post Office, besides placing a check upon the accuracy of the companies' returns on which the apportionment is made.

Since the institution of the parcel post in August 1883, the business of this department of the Post Office has enormously increased, the railway share of the parcel postage amounting now to over half-a-million per annum; and probably there is no better instance of economical administration than is afforded by the distribution of this fund amongst some hundred and thirty companies.

Since the year 1847 the Railway Clearing-house, as a central establishment well adapted for the purpose, has been employed to facilitate the recovery of lost luggage, a duty which it discharges in the following manner. A description of every article lost or found is forwarded daily to the clearing-house, who, in turn, furnish the information to the different stations, and anything found on hand at a station which answers to the description of an article lost is forwarded to identification.

The clearing-house is an institution of unquestionable

benefit to all parties concerned—railroads and shippers alike.

When electric tramways and light railways have built up an enormous goods traffic business (which will undoubtedly come to pass in the future) it will be advisable to adopt the methods and organisation similar to railroads.

It is only a matter of time when railroads will adopt electrical energy as a motive power, and there is no reason in the author's opinion why an harmonious combination cannot be agreed upon with existing railroads. He strongly advocates such a line of action, because serious pitfalls, set-backs, etc., will certainly occur by not profiting by the experiences of other large and similar undertakings.

RATES FOR CONVEYANCE OF GOODS.

SOUTH LANCASHIRE TRAMWAYS.

Express Parcels Service between Liverpool and Birkenhead:—

Aigburth
Aintree
Allerton
Anfield
Arrowe

Barnston
Bebbington
Bidston
Blundellsands
Bootle
Brighton-le-sands
Brimstage
Broadgreen
Bromborough

Cabbage Hall
Childer Thornton
Childwall
Clatterbridge
Claughton
Clubmoor
Cottage Homes (Fazackerley)
Cressington
Crosby

Dingle
Docks (Liverpool and B'head)

Eastham
Edge Hill
Egremont
Everton

Fairfield
Ford
Frankby
Fulwood Park

Garston
Gatacre
Gayton
Grassendale
Greasby
Greenbank

Heswall
Hinderton
Hoylake
Hooton
Huyton

Kirkdale
Knotty Ash
Knowsley (to Huyton Depot)

Linacre
Litherland
Liscard
Little Sutton

Meols
Moreton
Mossley Hill

Neston
Newsham Park
Noctorum

Old Swan
Orrell

Otterspool	Raby Dale	St. Michaels	Upton
Oxton	Raby Mere	Spital	
	Roby	Storeton	Wallasey
Parkgate	Rock Ferry		Waterloo
Port Sunlight		Thingwall	Wavertree
Poulton Liscard	Seacombe	Tranmere	West Kirby
Poulton Cum Spital	Seaforth	Tue Brook	Woolton
Prenton	Sefton Park		
Princes Park	Stoneycroft		

And St. Helens, Bolton, Wigan and Leigh:—

Abram, Atherton, Ashton-in-Makerfield, Bamfurlong, Brynn, Eccleston Park, Haydock, Hindley, Hindley Green, Hindsford, Howebridge, Ince, Knotty Ash, Lowton Common, Peasley Cross, Pennington, Platt Bridge, Prescot, Rainhill, Sutton, Thatto Heath, Tydesley, Whiston and Holt, etc., etc.

Scale of Charges.

Weight.	Per Parcel. s.	d.
Up to 3 lbs.	0	3
Over 3 lbs. and not exceeding 14 lbs. . .	0	4
,, 14 ,, ,, 28 lbs. . .	0	5
,, 28 ,, ,, 42 lbs. . .	0	6
,, 42 ,, ,, 56 lbs. . .	0	7
,, 56 ,, ,, 72 lbs. . .	0	8
,, 72 ,, ,, 84 lbs. . .	0	11
,, 84 ,, ,, 112 lbs. . .	1	1
,, 112 ,, ,, 120 lbs. . .	1	3
,, 120 ,, ,, 130 lbs. . .	1	4
,, 130 ,, ,, 140 lbs. . .	1	5

China, glass, pictures, and all other fragile and brittle articles liable to damage, are carried only at the Owner's sole risk, unless properly packed and protected, marked "Glass," so declared at the time of booking, and an extra rate of 50 per cent. paid on same.

All Parcels are received and forwarded subject to the General Conditions and Regulations in operation of the Company in whose possession they may be at the time being.

Fractions of a Penny to be charged as a Penny. Each parcel to be charged for separately.

Frequent collections. Low rates. Prompt deliveries. Quick transit.

Special Low Rates for milk and small quantities of Dairy Farm Produce on application.

Parcels for Despatch by Railway.—Special arrangements for despatch of Parcels by Railway at frequent intervals to all parts of the United Kingdom at Ordinary Rates, no extra charge for conveyance on the Trams.

RATES FOR CONVEYANCE OF PARCELS BY PASSENGER TRAINS ON RAILWAYS.

Not exceeding	Up to 30 Miles.	Up to 50 Miles.	Up to 100 Miles.	Above 100 Miles.
lbs.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
1	0 4	0 4	0 4	0 4
2	0 4	0 4	0 4	0 4
3	0 5	0 5	0 5	0 5
4	0 6	0 6	0 6	0 6
5	0 6	0 6	0 7	0 7
6	0 6	0 6	0 8	0 8
7	0 6	0 8	0 9	0 9
8	0 6	0 8	0 10	0 10
9	0 6	0 8	0 11	0 11
10	0 6	0 8	1 0	1 0
11	0 6	0 8	1 0	1 0
12	0 6	0 8	1 0	1 1
13	0 6	0 9	1 1	1 2
14	0 6	0 9	1 1	1 3
15	0 6	0 9	1 2	1 4
16	0 6	0 10	1 2	1 5
17	0 6	0 10	1 3	1 6
18	0 6	0 10	1 3	1 7
19	0 6	0 11	1 4	1 8
20	0 6	0 11	1 4	1 9
21	0 6	0 11	1 5	1 10
22	0 6	1 0	1 5	1 11
23	0 6	1 0	1 6	2 0
24	0 6	1 0	1 6	2 0
Above 24 lbs., per lb.	0 0½	0 0½	0 0¾	0 1

Fractions of a Penny will be charged as a Penny.

When more parcels than one for the same consignee are sent by the same train they are charged separately.

EXTRACT FROM THE LEEDS TRAMWAYS ACT, 1871.

Rates for the Conveyance of Goods, etc.

For any Parcel not exceeding 7 lbs. in weight . .		3*d.*
,, ,, exceeding 7 lbs. but not exceeding 14 lbs. in weight		5*d.*
,, ,, exceeding 14 lbs. but not exceeding 28 lbs. in weight		7*d.*
,, ,, exceeding 28 lbs. but not exceeding 56 lbs. in weight		9*d.*
,, ,, exceeding 56 lbs. but not exceeding 500 lbs. in weight . . .	Such sums as the Promoters may think fit.	

END OF SECTION II.

SECTION III.

Season Tickets—Workmen's Tickets—and Reports from various Undertakings Appertaining to the Above.

THE subject of Season and Workmen's Tickets, is one which has from time to time engaged the attention of nearly every tramway manager in Great Britain.

By the kind courtesy of John Young, Esq., general manager of the Glasgow Corporation Tramways, and J. B. Hamilton, Esq., general manager of the Leeds Corporation Tramways, the author is able to present for the benefit of his readers two excellent reports, one on the question of Season Tickets, and the other dealing with Workmen's Tickets, which give full information as to what has been or is being done in regard to the above questions.

GLASGOW CORPORATION TRAMWAYS.

REPORT BY THE GENERAL MANAGER IN TERMS OF MINUTE OF TRAMWAYS COMMITTEE OF 18TH FEBRUARY, 1903, ON THE QUESTION OF THE ISSUE OF SEASON TICKETS.

(*Inserted by kind permission of John Young, Esq.*)

SEASON TICKETS.

As desired by the committee on 18th February last, I have again gone carefully into the question of season tickets. In order

to obtain the fullest information on the subject, I have communicated with the officials of all municipal corporations and public companies operating tramways in Great Britain and Ireland, and also with the officials of a large number of tramway companies on the Continent. A synopsis of the replies received is given as an Appendix to this report.

There are no season tickets in use on any of the street railway systems of America.

From the replies received it will be observed that in this country season tickets are at present more or less in use on the following tramway systems, viz.: Aberdeen, Blackpool, Burnley, Edinburgh (one route), Guernsey, Ipswich, Leicester, Oxford, Portrush, Rochdale, Southport, Stirling and Bridge of Allan, and Wigan.

It will also be observed that at one time season tickets were in use in Birmingham, Huddersfield and St. Helens, but for various reasons their use has been discontinued.

On none of the numerous other tramway systems in this country—and they embrace all the larger towns and cities—have season tickets been introduced. And the replies indicate that for city tramways the question is not likely to be seriously entertained.

From a number of replies which have been received from the Continental cities, it is evident that season tickets have been very generally adopted, at least in Germany. Very little satisfaction however, is expressed regarding their operation.

The reasons given in the replies for the non-adoption or abolition of season tickets are exactly what I have stated from time to time when the question has been spoken of.

Looking first of all at the reasons which are given for discontinuing the issue of season tickets, we find that in Birmingham they interfered with the conductor's ordinary duties, and trouble was caused through holders refusing or delaying to show their tickets when asked to do so by the conductor. In Huddersfield the system was stopped because it was likewise abused, and the Corporation has refused to reintroduce it although asked to do so on several occasions. In St. Helens, also, holders of season tickets refused to show them, and other passengers professed to be season ticket-holders who were not.

The general experience of those places where season tickets are presently in use is unfavourable. These tramway systems are comparatively small, and very few season tickets are in use. On these small systems, or portions of systems, it is said the conductors

and inspectors have every opportunity of knowing the holders of season tickets, but notwithstanding this the system does not seem to be looked upon with favour. In the case of the line from Edinburgh to Portobello, the Guernsey line, the Portrush line, and the Stirling and Bridge of Allan line, there may be special reasons for adopting season tickets, but it seems clear that what would suit on these small sections of tramways could not be applied to a large city system. The chief objections to the issue of season tickets are in regard to checking, indentification, and loss of revenue.

As before stated, season tickets seem to be in general use in the German cities. A common practice is to have the owner's photograph on the ticket. The same difficulties, however, in regard to checking are experienced as in this country. Holders of tickets have a strong objection to show them at any stage of the journey, and the general opinion of Continental managers is that the issue of season tickets for tramways is a mistake.

It is quite evident from the replies that the consensus of opinion, both in this country and on the Continent, is against the issue of season tickets.

Looking at the question on its merits, as applied to the Glasgow system, first of all from the passengers' point of view, I take it that the only real object in possessing a season ticket would be to get cheaper travelling. There is no city in the kingdom where tramway travelling is so cheap as it is in Glasgow. 35 per cent. of our passengers pay only ½*d.*, and the average fare is ·89*d.* The greater proportion of the tramway revenue is contributed by the wage-earning classes of Glasgow. This, however, is not the class who ask for or would purchase season tickets. Indeed, they are unable to do so. It seems to me that it would be unfair that a corporation, representing all classes of the community, should, at the expense of the poorer travellers, create a favoured class of passengers by carrying those who are prepared to prepay their fare for a given period at a cheaper rate than others who can only pay their fare on each journey.

Looking at the question from the management point of view, I cannot see any advantage that season ticket-holders would confer on the Corporation. Payment on the car is an eminently satisfactory cash transaction, and the prepayment of a few fares is not worth considering. Holders of season tickets would undoubtedly wish to travel during the "rush" hours—morning and evening—when there is always the greatest difficulty in making provision for

the traffic. There would no doubt be unpleasantness should season ticket-holders not be able to find seats at these hours. The universal complaint from those who have had experience with the issue of season tickets is that holders will not show them when asked to do so, and conscientious conductors are worried and delayed. Less scrupulous conductors are often satisfied with a nod, and abuses quickly creep in. Such abuses are found even on small tramway undertakings, which have no ½*d.* fares, and on which it is said the conductors and inspectors can soon know the holders of season tickets. What would the result be on a system like the Glasgow Corporation tramways, employing about 1,000 conductors, whose duties rotate, and who have ½*d.* fares to collect on every route? It must be obvious that, with ½*d.* fares and cars carrying on the average 500,000 passengers per day, with a "rush" traffic morning and evening, the satisfactory checking of season tickets is not possible. Season tickets, in my opinion, would be unfair, disadvantageous and impracticable in Glasgow. I have no hesitation in saying that the sound principle to go upon is to give the travelling public the best possible facilities at the lowest possible fares, to make the fares equal to all, and to collect all fares on the cars. There is, in my opinion, no case for privileged tickets on the Glasgow Corporation tramways.

TRANSFERS.

I have also been requested to report on the question of transfer tickets.

There are no transfers in use on any tramway system in Britain except to a small extent in Edinburgh. Here, however, ½*d.* fares are not in operation, except on one section. Transfers are universal in America, where there is one high universal fare of 2½*d.* Indeed, it is because the American companies insist in maintaining this high uniform fare that the companies have had to grant free transfers. Free transfer is intended to meet the case of a passenger who has paid the uniform 2½*d.* fare for a short distance wishing to travel a short distance by another route. But there is no analogy between the American practice and ours, which gives fares graded down to ½*d.*

It may be pointed out that in American cities—where it is well known that transfer tickets are greatly abused—the number of passengers carried per car mile is only five or six, and it might be

comparatively easy for the conductor to grant all the transfers that may be required. In Glasgow, however, it is altogether different, the average number of passengers per car mile being as high as fourteen. This means that our conductors have to deal with nearly three times as many passengers as in America. We have about fifty junctions where transfers might be asked. Any one can see that it would be impracticable to issue transfers at the rush "hours" even if it were desirable. But really, if we are to have fares at all, transfers with ½*d.* fares is surely a proposition which cannot be entertained. It will no doubt be quite evident that with our graded fares and the popular and convenient ½*d.* fare, which is so greatly taken advantage of, transfers are not only quite unnecessary, but also absolutely unworkable.

JOHN YOUNG, *General Manager.*

88 RENFIELD STREET, GLASGOW,
11th April, 1903.

LIST OF QUESTIONS REGARDING SEASON TICKETS SUBMITTED TO MUNICIPAL CORPORATIONS AND COMPANIES OPERATING TRAMWAYS.

1. On what scale are your charges for "seasons" based?
2. How does the charge for "seasons" compare with the rates charged for season tickets on railways on your district?
3. Are your "seasons" universal, or do you issue them for certain sections?
4. Whether do you find that "seasons" increase or lessen the work of the conductor?
5. Can you give any idea as to how the revenue is affected by the issue of "seasons"?
6. How does the conductor identify the producer of "season" as the *bonâ-fide* proprietor of same?
7. What difficulties, if any, do you experience in dealing with "seasons"?
8. Do you find the artisan or working class take advantage of "seasons"?
9. Has the issue of "seasons" created any difficulty in carrying intending passengers at "rush hours"?
10. Can you say what proportion of your passengers purchase "seasons"?
11. Do you recommend the use of "seasons"? if not, why not?

GLASGOW CORPORATION TRAMWAYS.

SEASON TICKETS.

REPLIES TO INQUIRIES REGARDING SEASON TICKETS RECEIVED FROM MUNICIPAL CORPORATIONS AND COMPANIES OPERATING TRAMWAYS, BOTH IN THIS COUNTRY AND ON THE CONTINENT.

GREAT BRITAIN AND IRELAND.

I.—TRAMWAY SYSTEMS ON WHICH "SEASONS" ARE ISSUED.

Aberdeen Corporation.—The Corporation of Aberdeen issues season tickets. The price is based on three single journeys per day on the section for which the "season" is available, and is much higher than the price of railway "seasons." "Seasons" are only issued for certain sections. The General Manager is of opinion that "seasons" lessen the work of the conductors, and that the revenue is benefited. No regular system of identification is in operation. The conductor is very soon able to identify season ticket-holders, as they travel frequently. When a ticket is issued, the holder shows it to the conductor of the respective cars by which he may be travelling, which enables the conductor to identify the man as a season ticket-holder. Tickets are requested to be shown once a week, a change of day being made each week for this purpose. The issue of season tickets entails a good deal of clerical work. Practically no "seasons" are taken out by artisans. Special cars are provided at "rush" hours to accommodate season ticket-holders. About 3⅛ per cent. of the passengers are season ticket-holders. The General Manager is a strong believer in season tickets.

Blackpool Corporation.—The Corporation of Blackpool issues season tickets. The price of "seasons" works out at about 2*d.* per day. They have no railway competition. The tickets are universal. The General Manager is of opinion that they lessen the work of the conductors, but he cannot say how the revenue is affected. Conductors have no means of identifying season ticket-holders, who merely say "Contract" when asked for their tickets. The working classes do not take advantage of "seasons." No difficulties have been created on account of the issue of these

tickets. The General Manager is not in favour of issuing season tickets, the reasons being obvious to all tramway managers.

Burnley Corporation.—The Corporation of Burnley issues student and apprentice tickets only. Scale up to seventeen years of age—

Miles.	Per Quarter.	Per Annum.
1½	10/	35/
2½	12/6	45/
3½	15/	55/

Ordinary season tickets were issued at one time, but were abolished a few months ago. Passes are issued to Corporation departmental officers, and the committee pay 5*l.* per annum, available over the whole borough—4¼ miles. The "seasons" were issued for certain sections. The use of these tickets lessens the work of the conductors. The income from this source was very small compared to the aggregate. The General Manager does not recommend the use of "seasons," except to children and apprentices. They are unsuitable for tramways, owing to the practice of non-production of the tickets every journey. Kept at a safe minimum, there is no objection to the system for financial reasons.

Edinburgh and District Tramways Company.—This Company issues "seasons," but only on one section—4¼ miles; price, 3*l.* 10*s.* per annum. This was the same price as the railway third-class season-ticket, but the railway company have since reduced the price of their ticket to 3*l.* per annum. The General Manager considers that the work of conductors is lessened, but he cannot say whether the revenue is affected, as "seasons" have only been in use since January of this year. All season ticket-holders must show their tickets each time they travel. No difficulties have as yet been experienced in dealing with season tickets. The working classes do not purchase these tickets. The General Manager cannot say what proportion of passengers purchase "seasons." He expects a great many will be purchased at house-letting time. He recommends the use of "seasons" on such a route as the one in question, but he is not sure about issuing "seasons" for city main lines.

Guernsey Railway Company.—This Company issues "seasons" for certain sections; price, 1*l.* 5*s.*, 1*l.* 15*s.* and 12*s.* 6*d.* for three months, according to distance. The Manager considers that the work of the conductors is lessened, and that the revenue is favour-

ably affected. The conductors have no means of identifying the season ticket-holders, but they soon become known to both inspectors and conductors. No difficulties are experienced in dealing with "seasons." The working classes do not purchase "seasons." They are purchased principally by business people and school children. The Manager considers that the proportion of passengers who purchase "seasons" is small. He recommends "seasons" generally, but each locality would have to be considered on its merits.

Ipswich Corporation.—It had been the practice of Ipswich Tramways Company, whose undertaking the Corporation has recently acquired, to issue season tickets, and the Corporation is continuing this for a few months until the new electric tramways are at work, when the whole question will be reconsidered. Their experience is so limited that they cannot give any useful information on the subject. The Town Clerk is doubtful whether season tickets will be issued under the new *régime.*

Leicester Corporation.—This Corporation issues season tickets, but principally to officials of other departments of the Corporation. The number issued is so small (under 100) that they are not worth considering. At present the tramways are wrought by horse traction, and the committee have not considered the question with regard to the future systems. The General Manager does not think it likely that they will be generally adopted, owing to the difficulty of identification.

Oxford Tramways Company.—Oxford Tramways Company issues season tickets over the whole system, but not for a less period than one year; price, 7*l.* 7*s.* per annum. "Seasons" lessen the work of the conductor. Holders must on every occasion show their tickets. No difficulties are experienced in dealing with "seasons." The working classes do not take advantage of "seasons." There are only about thirty season ticket-holders, and the Directors object to the issue of season tickets.

Portrush Tramways Company.—This Company issues season tickets at half the cost of the ordinary fare, which is about the same as is charged by the railway company. They are issued for not less than a section of six miles. The Manager considers they lessen the work of the conductors, and that the revenue is slightly increased. All ticket-holders must carry their tickets and exhibit them when demanded. No difficulties are experienced in dealing

with season tickets. Artisans do not purchase these tickets, and only a very small percentage are issued to other passengers. The Manager is of opinion that season tickets are a decided advantage.

Rochdale Corporation.—The Corporation of Rochdale issues season tickets, and the price varies from 2*l.* 7*s.* 6*d.* to 4*l.* 10*s.* per annum, according to distance travelled. They are issued only on one section, but they would be made universal if required. The work of conductors is lessened, and the conductors are kept to one route, and thus get acquainted with season ticket-holders. No particulars can be given as to how the revenue is affected. No difficulties are experienced in dealing with season tickets. These tickets are not purchased by the working classes. The percentage of passengers who purchase "seasons" is small. The General Manager would recommend the use of season tickets for both ordinary and workmen's cars, but he does not think that workmen would purchase a "season," as they prefer to pay weekly, and weekly "seasons" would be difficult to deal with, if not altogether too costly.

Southport Corporation.—There are two distinct tramways in Southport—one worked by the Corporation and one leased to the British Electric Traction Company. The Corporation and the Company have an agreement by which a universal "contract" is issued over all lines in the town for 5*l.* per annum. The number of these issued is very small. "Seasons" affect the work of the conductor very little, as the conductor is required to book the contract number instead of collecting the fare. The revenue derived from "seasons" is 500*l.* per annum, but the Manager is of opinion that a loss is sustained on "seasons." Being a residential town, the conductors very soon get to know holders of "seasons." The working classes do not purchase these tickets to any extent. No difficulty is experienced in carrying intending passengers at "rush" hours. The Manager cannot say what proportion of passengers purchase "seasons." He is personally averse to issuing "seasons," as he considers they result in a loss.

Stirling and Bridge of Allan Tramways Company.—This Company issues season tickets—

3 miles	£1 per mile per annum.
1⅛th miles	35/ ,, ,,
1 mile	30/ ,, ,,

The tramway rate is about double the railway rate, which was

reduced to less than half the former price, for competitive purposes, when the tramways started. The "seasons" are issued for certain sections. The Manager is doubtful whether the issue of these tickets lessen the work of the conductors, and he cannot say whether the revenue is affected in any way. As the undertaking is small, the holders of these tickets are personally known to the conductors. There are many difficulties experienced in dealing with "seasons." Holders travel without their tickets, and delays sometimes occur in renewing these tickets, and persons try to avoid payment of the fare by professing to be holders of season tickets. The working classes do not purchase these tickets. Some difficulty is experienced in carrying intending passengers at "rush" hours. The General Manager cannot say what proportion of passengers purchase "seasons," and he is entirely opposed to the issue of these tickets.

Wigan Corporation.—This Corporation issues season tickets for the whole system or for certain sections; price, 4*l.* per annum for two miles. The railway season tickets cost 3*l.* per annum for the same distance. "Seasons" do not affect the work of conductors in any way. The Manager is of opinion that the revenue is adversely affected by the issue of these tickets. The conductors soon come to know the *bonâ-fide* season ticket-holders. Very few "seasons" are issued to the working classes, and no difficulty is experienced in carrying intending passengers at "rush" hours. Four hundred season tickets are issued per annum. The Manager is not in favour of issuing these tickets, on account of the difficulty in arriving at the correct number of passengers carried and the risk of fraud.

II.—Tramway Systems on which "Seasons" were Issued, but have been Abolished.

City of Birmingham Tramways Company.—This Company does not issue season tickets, as it is considered that they would greatly interfere with the checking arrangements. It is some years since the issue of season tickets was given up.

Huddersfield Corporation.—The Corporation of Huddersfield has no season tickets. Season tickets were issued in the days of the steam tramways, but were found to be abused to such a degree that they were abolished; and, although the matter has been brought up from time to time the Tramways Committee refuse to reconsider it.

New St. Helens and District Tramways Company.—This Company issued season tickets over the whole system for some time, but they have been done away with. The railway season tickets were cheaper than those issued for the tramways. The work of the conductor was lessened. The revenue was decreased when these tickets were issued. The management relied upon the conductors knowing season ticket-holders personally. Some difficulty was experienced in identifying season ticket-holders who objected to show their "seasons," and other passengers who were not ticket-holders said "Contract," and thereby defrauded the Company. No difficulty was experienced in dealing with the traffic at "rush" hours. There were only about 150 season tickets issued. The General Manager was decidedly against recommending the issue of these tickets, and, after a long trial, the directors decided to abolish them altogether. The receipts improved considerably afterwards, and there is no doubt that the privilege was very much abused.

Potteries Electric Traction Company.—The North Staffordshire Tramway Company does not issue season tickets, neither does this Company, by whom the North Staffordshire lines are now being worked. Season tickets were abolished three or four years ago, when the working by steam was discontinued.

III.—Tramway Systems on which no "Seasons" are Issued.

Accrington Steam Tramways Company.—At the last general meeting of the shareholders the question of issuing season tickets was mentioned, but the directors have not considered the question, nor do they intend doing so, as they cannot see where any benefit would be derived from the issue of season tickets.

Ayr Corporation.—The Corporation of Ayr does not issue season tickets. At one time this matter was considered, but partly from the unfavourable replies received from several who used or had at some time past used them, combined with a strong feeling which the General Manager had against them, the Tramways Committee gave up the idea. The Manager considers it would lead to no end of trouble in the way of season ticket-holders complaining who could not get on a car. Those who took out season tickets in summer, when there is a heavy service, although purchased under certain conditions, would agitate for keeping up the heavy service all winter, and, worst of all, it would assist dishonest conductors con-

siderably, as it is found that men are oftener detected by inspectors watching how many are on a car at a certain point, and then examining the way-bill for that round, than by boarding the car. It would be a splendid excuse for missed fares, and would lead to no end of fraud. The argument often put forward that railways can do it, won't hold good with reference to tramways. Take a man who spends regularly 8*d.* per day on cars. He would turn blue in the face if asked even for 6*l.* for a ticket for twelve months, which would be under half what he pays when paying it out in pence. Then, where would the difference between the 6*l.* and the 12*l.* 2*s.* 8*d.* be made up? Certainly not by additional passengers induced to travel on account of the cheap ticket offered, for the man who won't spend 4*d.* for, say, one journey each way per day, in place of the other man's 8*d.*, is not likely to give 6*l.* a year. If trailers were put on at the "rush" hours for season ticket-holders, they might help, but trailers are dangerous, and, of course, are prohibited.

Barking Town, Essex. Barking Beckton Light Railway.—The line owned by this Company is entirely for workmen, and is 1·25 miles long. It will be opened in about two months. No season tickets will be issued. The question was considered fully, but the directors saw the probabilities of abuse and transference.

Barrow-in-Furness Tramways Company.—This Company does not issue season tickets.

Belfast Tramways Company.—This Company does not issue season tickets. The Manager is of opinion that the revenue would be most disastrously affected. He considers that it is impossible for the conductors to identify *bonâ-fide* proprietors of "seasons," when each car carries over 1000 passengers per day. He does not consider that season tickets could be controlled in the slightest degeee in a large city tramway, and is entirely opposed to the issue of such tickets.

Birkenhead Corporation.—No season tickets are issued on this system. The General Manager is directly opposed to the use of passes of any description on a tramway, unless it is worked in a purely rural district. He believes that it is impossible to properly check the payment of fares when passes are issued on cars where the passengers are frequently changing, and where a considerable number of fares begin and end on each length of route. From personal experience which he had some years ago with a form of

pass which was issued, he has no hesitation in saying that, despite all effects at checking, the moment passes are issued fraud becomes comparatively easy. One case especially came under his notice, where one pass was being made to answer for several persons in the same family. It is not possible to compare a tramway with a railway when considering this question, the conditions being altogether different. Then, again, there would arise the question of further reducing what are already, on all municipal tramways, very cheap fares, which have in many cases been fixed at a minimum. He is of opinion that trouble would arise at "rush" hours.

Blackburn Corporation.—The Corporation of Blackburn does not issue season tickets. The subject has not been under the consideration of the Tramways Committee.

Blackpool and Fleetwood Tramroad Company.—This system is a tramroad of about six miles, connecting two towns by a short length of tramway in each, and the issue of season tickets could not be compared with that of a tramway in a town or city.

Bolton Corporation.—No season tickets are issued on this system. The Tramways Committee has had this question before them on several occasions, but the matter has been deferred.

Bradford Corporation.—There are no season tickets in Bradford, and the matter has not yet had the serious consideration of the Tramways Committee. It has been discussed in committee, but the difficulties in the way of distinguishing passengers who are "pass" holders and those who are not appeared at the time to be an obstacle not easily overcome. Apart, however, from the checking difficulty, the Manager is of opinion that if season tickets were entertained, they could not be issued at such a rate, in view of the present low ordinary fares, as to be of any financial benefit to the holders.

Brighton Corporation.—The Corporation of Brighton does not issue periodical or season tickets on the tramway system. The matter has received consideration, but owing to the complications that would arise in respect of maintaining a proper check on the conductors' returns, which would without doubt be serious, it has been decided to use only the tickets issued by the conductors on the cars.

Bristol Tramways and Carriage Company.—This Company has not adopted any system of season tickets, and it is not intended

to do so. The Manager is of opinion that season tickets are quite unsuitable for tramway purposes.

Cambridge Tramways Company —This Company does not issue season tickets, and does not intend to do so.

Cardiff Corporation.—The question of season tickets was mentioned some time ago at one of the Tramway Committee meetings, and it was thought desirable to leave so important a question in abeyance until the tramway system had a fair trial, and nothing has yet been done in the matter.

Chester Corporation.—The General Manager has never had any experience with season tickets ; and is decidedly opposed to them, as they lead to fraud and confusion.

Cork Electric Tramways and Lighting Company.—No season tickets are issued on this system. To check all passengers on the cars, several occasions by the directors, but no action has as yet been taken by the Company. There are several objections to the issue of such tickets. There is one great difference between "seasons" on railways and on tramways. On the former the holder has to pass a barrier where an official is stationed, who gets to know all season ticket-holders. Of course, there is no such official on tramways. Another point is that a single tramway "season" would be liable to be used by a whole family or friends all day long for short rides. Also in "rush" hours season ticket-holders would claim precedence and grumble, and want special arrangements. On fine Sundays some season ticket holders would almost live on the cars, to the great loss of cash traffic.

Coventry Tramway Company.—Season tickets have not been issued for use on the cars of this Company.

Croydon Corporation.—No season tickets are issued on this system. To check all passengers on the cars, season ticket numbers should be entered by conductor each time the holder travels, and this necessarily involves additional clerical work for the conductor. The Manager has had considerable experience on the Birmingham and other tramways with regard to the issuing of season tickets, and has formed the opinion that the revenue is not increased by their issue. Seasons are only taken out by a class of people who can well afford to pay a cheap fare each time they travel. The season ticket-holder will travel very frequently. A large number of them usually join the car at meal and other busy times, and crowd out the ordinary paying passenger, from whom a

higher average fare is received. The issue of "seasons" on a tramway practically means two classes of fare—one to the persons who can afford to put down 20*s.* or 30*s.* per quarter, and who are never slow to take more than full value; and the second is that paid by the working man, who is not in a position to pay the amount required for the privilege of a "season." There is thus two classes of fare—one for the "well-to-do," and the other for the "poor." On a large tramway system the conductor cannot possibly identify the holder. "Seasons" can be, and are, transferred, and frauds are thus committed on the tramways. The holders either forget or purposely delay renewing at the proper periods. They have to be circularised, etc. etc. Additional books, records, etc. etc., have to be kept, involving extra and unnecessary clerical work. The working classes do not purchase these tickets. They cannot afford to put down the money in payment of a "season." Based on previous experience, a small percentage of the ordinary travelling public purchase these tickets. The General Manager does not recommend the issue of "seasons" for the following reasons :—

(*a*) They do not increase the revenue.

(*b*) Their issue means additional work for conductors.

(*c*) The holders can be parties to fraud by transferring their "seasons."

(*d*) Holders object to always show their "seasons" to a conductor, and he is thereby delayed in his work.

(*e*) Their issue opens the door to fraud on the part of those conductors inclined that way, in putting down the numbers of "seasons" on the way-bills when the real holders do not travel.

(*f*) The unnecessary and additional office records.

He is of opinion that the proper way to conduct a tramway is to have cheap fares, the same for the "well-to-do" and "poor" alike, and to be paid for each journey—the latter greatly assisting ticket inspectors in correctly checking both conductors and passengers, many of the latter requiring this more than the conductor.

Darwen Corporation.—No season tickets are issued on this system.

Devonport Tramway Company.—Season tickets are not issued on this system. The question has been fully considered, and it has been decided not to issue any season tickets. The General

Manager believes that any person who can afford to purchase a season ticket can, and ought to, pay full fare.

Dewsbury, Batley and Birstal Tramways Company, Limited.—This Company does not issue season tickets except to school children, and these are almost a negligible quantity. They are issued at quarter and half rates, according as the children are under or over twelve years.

Dover Corporation.—No "seasons" or periodical tickets are issued on this system. The subject has not yet been before the Tramways Committee for consideration, owing probably to the fact that there is only one fare, viz., 1*d.* all the way.

Doncaster Corporation.—This question has not yet been considered by the Tramways Committee.

Dublin United Tramways Company.—This Company has not seriously considered this question. The General Manager thinks that where fares are very low season tickets could hardly be adopted without some considerable loss. Moreover, the difficulty of control, and the abuse which the system has met with on the various systems where it has been tried, do not encourage the Manager to recommend the introduction of the system to his directors.

Dudley, Stourbridge and District Electric Traction Company.—No season tickets are issued on anv part of this system. From experience the Manager has had on the Birmingham and Midland section of the tramways, the season tickets were not a success, and were withdrawn after a few years' use. The rate obtained from the use of season tickets was a very low one, and not remunerative.

Dundee Corporation.—No season tickets are issued on the Dundee Corporation Tramways. The question of issuing season tickets on the tramways has never been considered by the Corporation of Dundee. The Manager says that to issue season tickets at anything approaching an equitable basis is an impossibility, unless some restriction could be imposed and enforced limiting the extent, to which such ticket could be used. For instance, persons engaged in ordinary business, or workmen, would not be likely to use the cars on an average more than four or five times per day. Other classes of persons, such as collectors, canvassers, etc., would possibly find it convenient to use the cars ten times as often as the classes above named, and consequently would be deriving many times the benefit that could be possible to these classes.

Tramways differ from railways in respect that they are in the streets, and always available to the people; to use a railway it is necessary to go to a station, possibly a greater distance off than the place to which the person wishes to travel, and which could be reached by the cars. In railway practice it is ascertained that season ticket-holders average somewhere about four trips per day, and it is quite obvious that to ordinary persons this is about as many trips as it is possible for them to take. He is of opinion that if season tickets were issued for tramways, they should be in the form of a small vest-pocket book with the pages perforated in squares, one square to be torn off by the conductor on each trip taken by the holder. This would get over the difficulty described above. Other questions, such as guaranteeing accommodation at "rush" hours and the identity of the holder of the ticket, would require to be provided for.

East Ham District Council.—The question of issuing season tickets has been considered on several occasions by the Council, but it has been decided that it would not be advisable to issue these tickets in this district, for various reasons, chiefly because the whole district is divided into halfpenny sections, and owing to the geographical position, and the fact that the tramways are confined to the borders of the parish, these sections vary from ½ mile to 1¼ mile in length. If "seasons" were adopted, owing to the smallness of the system, it would be necessary to make them universal, and as the district forms a part of the Metropolis of London it is not considered likely that there would be any reasonable demand for them. As the traffic comes in rushes during certain times of the day, the Council think that "seasons" would seriously hamper the conductors, and with, the short halfpenny stages, possibly be the means of losing many fares, as the conductors would have to demand that the "seasons" be shown, or else run the risk of being cheated. One cantankerous season ticket-holder, by refusing to show his ticket promptly on demand, or pernaps by pleading that he had left it at home, etc., could, with the short sections, so occupy the time of the conductor that he might lose any number of fares, by not having time to collect them before the passengers alighted. It was also thought that it would be certain to lead to confusion in making out the way-bills and taking account of the passengers carried, especially where the sections did not exceed ¼ mile in length,

and the conductor had to collect fifty-six fares and enter them up. In these cases there would certainly be no time to demand or examine "seasons." The General Manager is of opinion that a number of passengers would attempt to ride free by giving the usual "nod" or the word "Season." On these grounds, and the fact that the cars practically run at workmen's fares all day long, the Council decided that it would not be advisable to issue season tickets.

Edinburgh Street Tramways Company.—No season tickets are issued by this Company. The General Manager recommends that season tickets should only be issued to a limited extent, and for long-distance passengers. There would be great difficulty in checking *bonâ-fide* proprietors of season tickets, and holders would claim first place at "rush" hours. The fares are apparently cheap enough already, without their being reduced by issuing season tickets.

Farnworth Corporation.—No season tickets are issued by the Farnworth Corporation. Weekly tickets are issued to workmen at half the usual rate per journey. Some difficulty is experienced in checking these tickets, as the conductor may omit to snip the ticket, and the inspector cannot always check it. It has been found necessary to allow workpeople to travel at any time during the day, on account of the varying time of starting and stopping work in the district. The demand for the weekly tickets is steadily increasing, but so far it has not been decided to allow others than artisans to travel with them. At present the weekly tickets are about 10 per cent. of the total receipts.

Gateshead and District Tramways Company.—This Company does not issue season tickets. The General Manager does not recommend the use of "seasons." He is of opinion that these tickets would increase the work of the conductor, and give loop-holes for dishonesty and neglect of duty, as well as being detrimental to the revenue.

Gloucester Tramways Company.—No season tickets have ever been issued on the Gloucester tramways.

Great Grimsby Street Tramways Company.—The question of season tickets has been discussed by the directors of this Company, but owing to the fact that, within the limits of the Borough of Grimsby, there is a uniform fare of 1*d.* for three miles on all routes, there is not the same demand for season tickets as there may be in other towns.

Great Yarmouth Corporation.—The Tramways Committee has had the question of season tickets under consideration, but has decided not to issue such tickets at present.

Greenock and Port-Glasgow Tramways Company.—No season tickets are issued by this Company. The matter was under consideration, but for many reasons the proposal was rejected, the main reason for declining to adopt them being that they do not pay. The General Manager has had experience of "seasons" on other systems, and found that they did not pay, and that they were often used by others than the *bonâ-fide* proprietors. Season ticket-holders very often grumble at being asked to produce their "seasons" every time they travel on the cars, and unless this is insisted upon, a proper check cannot be relied upon. In cases of "rush" traffic, where they cannot get a seat, season ticket-holders make far more complaints about traffic arrangements than ordinary passengers or even shareholders do, and in general they assume attitudes befitting owners of the system. The British Electric Traction Company employ private checkers, and where "seasons" are used their work is nullified to a great extent. Season tickets certainly lessen the work of conductors, but, taking them as a whole, the General Manager is not at all favourable to their issue, as there are so many different ways of abusing them.

Halifax Corporation.—The Tramways Committee of Halifax has never yet considered the question of season tickets in any form whatever.

Hull Corporation.—The Corporation of Hull does not issue season tickets, and does not contemplate doing so. They have an arrangement with the Post Office for conveying postmen and telegraph messengers, who travel at the rate of three-fifths of a penny for any distance. They give to the conductor vulcanite tokens, and receive from him penny tickets in the ordinary way. The tokens are periodically cashed by the Post Office. The committee has often been approached to give "seasons," but has always declined. There is only one fare—a penny—and as this allows a passenger to travel for from 2 to 2½ miles, it is considered good value, and the committee refuse to reduce it in the interest of those who would purchase season tickets. The General Manager considers that the issue of "seasons" would increase the work of conductors, as well as the clerical work of the department. If passengers could be induced to display their

"seasons" promptly, there might be no trouble; but the average passenger, after showing it a few times, would expect the conductors to identify a "nod" instead of the pasteboard, and an official who would insist on doing his duty would be worried and delayed. He cannot conceive how abuses could be prevented, and conductors enabled to distinguish between *bonâ-fide* and *malâ-fide* holders, except by an arrangement of photographs, which would have obvious objections. The General Manager is pleased that season tickets are not in operation in Hull.

Imperial Tramways Company, Middlesboro' and Stockton-on-Tees.—There is no system of season tickets in use on the cars operated by this Company. The directors have never considered the matter.

Isle of Thanet Electric Tramways and Lighting Company.—This Company does not issue season tickets.

Kidderminster and District Electric Lighting and Traction Company.—Season tickets are not issued by this Company. The General Manager considers that season tickets would be most unsatisfactory for small lines. There would be great difficulty in checking way-bills. Books of tickets at reduced rates are much preferable, if means are taken to prevent conductors issuing them to passengers.

Leeds Corporation. — Season tickets are not issued on any portion of the Leeds system. The matter has never been seriously considered up to the present time.

Liverpool Corporation.—No system of season tickets obtains on the Liverpool tramways, nor has the introduction of same received any serious consideration recently.

London County Council.—The question of the issue of season tickets has, from time to time, been under the consideration of the Council, but, up to the present, it has not been felt desirable to adopt the system. The circumstances influencing this decision have been many. In the first place, the ordinary fares in London are extremely low. Last year the average per passenger only amounted to ·88*d.* The people who are always asking for the issue of season tickets are those who want to travel at considerably less than the ordinary fare, however low it may be. The Manager is a strong advocate of cheap fares, but there is a point of cheapness beyond which it is not safe to go. Two of the strongest reasons against season tickets are—

(1) Difficulty in checking the conductors.
(2) Loss of revenue likely to arise at "rush" hours.

With regard to (1), in London they adopt the system of making everyone pay the ordinary fare. No tickets, complimentary or otherwise, are issued. Anyone riding on the Council's business has to pay like an ordinary passenger. In these cases the fare is refunded upon production of the tickets. Thus the checking of the cars by the inspectors is quite an easy matter, and the conductors' duties are much simplified. The Manager is writing from actual knowledge, having had experience in another town where special tickets of all kinds were in use, namely, "Discount Tickets," "Seasons," "Scholars'," "Complimentary," "Workmen's," etc. These tickets were an intolerable nuisance, giving the conductors, inspectors and office staff a vast amount of work, besides which their issue opened the door to a great deal of fraud.

With regard to (2), during "rush" hours the cars were full of "tickets," and would-be fare-paying passengers had either to wait, walk, or take another conveyance. This involves a very considerable loss of revenue. The argument which is so frequently used about getting the money in advance is not worth consideration.

London United Tramways Company.—This Company does not issue season tickets, and does not intend to do so.

Manchester Corporation.—The Tramways Committee has this matter under consideration, but have not yet come to any decision.

Manx Electric Railway Company, Isle of Man.—No season tickets are issued on this system. The directors have been quite recently considering the question of season tickets, but as the line has just been transferred to this Company their experience is not sufficiently extensive to enable them to offer reliable suggestions as to the general results attending the use of season tickets.

Middleton Electric Traction Company —This Company has not had this question under consideration up to the present. The Manager does not think that it would be entertained by the Board were it brought up. Personally, he is not at all in favour of issuing season tickets.

Newcastle-on-Tyne Corporation.—The Tramways Committee of Newcastle-on-Tyne has not granted any season tickets so far. The General Manager considers that the working of any arrangement of season tickets would be very difficult. The crowding-in of ordinary passengers upon season ticket-holders would give rise to

the same sort of complaint that is always heard of on railways in regard to this.

Northampton Corporation.—The question of season tickets has not been considered by the Tramways Committee.

Norwich Tramways Company.—The Company has considered the matter of season tickets, and has decided not to issue them. The General Manager is decidedly against the issue of season tickets. It is quite impossible for a conductor to identify the producer of a season ticket with the *bonâ-fide* proprietor. The work of checking conductors, which is sufficiently difficult already, would be absolutely impossible if "seasons" were issued. Passengers who now habitually ride two or three times a day would, if they took season tickets, expect to get the same for something less than they at present pay, and, having got it, would use the cars a very great deal, probably three or four times as much as they do at present. The Company would, therefore, be carrying three or four times the number of passengers for less money. There is absolutely no advantage whatever in season tickets, as it is quite as easy for a passenger to produce a penny as it is to produce a ticket. If a passenger is not required to produce his season ticket on every journey, a very large number of persons who have not season tickets will travel and say the word "Season" when asked for their fare. Season tickets have been tried by one or two tramways, and abandoned as hopelessly impracticable.

Nottingham Corporation.—No season tickets are issued on this system. The subject has not been under the consideration of the Tramways Committee.

Oldham Corporation.—Season tickets have never been in operation in Oldham.

Paisley Tramways Company.—This Company does not issue season tickets, and has not considered the matter.

Perth Tramways Company.—The question of season tickets was considered by the directors some years ago, but they came to the conclusion that it would not be possible to successfully introduce them in Perth.

Plymouth Corporation.—No season tickets are issued on this system. The question of season or monthly tickets has been considered at various times, but the Corporation cannot see what advantages would be conferred on the riding public, or what benefit it would be to the Corporation themselves, seeing that they are

carrying passengers at the present time 1¼ miles for a penny, hence they could not supply a "season" or book of tickets at a cheaper rate than what they are supplying single-journey tickets. Regarding less work to conductors, they would have to be equally as efficient in their duties if season tickets were issued as they have to be by simply issuing journey tickets; there would, comparatively speaking, be only a few out of the many who would avail themselves of the opportunity of taking a season ticket. Another point is, unless conductors are well acquainted with the people who purchase season tickets, the ticket holders are likely at times to transfer them to others, and thus the system would be greatly abused. The General Manager does not recommend the use of "seasons."

Poole and District Electric Traction Company.—This Company has never issued season tickets. The General Manager had experience of season tickets while Divisional Superintendent in the City of Birmingham Company until 1899, and he found that they interfered with the duties of conductors, many holders refusing to give their numbers or produce their tickets when requested, also stopping others who paid full fare from riding. The class of people who would purchase season tickets would be merchants, tradesmen, clerks and gentlemen, and not more than 1½ per cent. of the work-people would purchase "seasons."

Portsmouth Corporation.—This Corporation does not issue season tickets, and the subject has never been under consideration.

Preston Tramways Company.—No season tickets have ever been issued on this system.

Reading Corporation.—The issue of season tickets has not been considered.

Salford Corporation.—No season tickets nor workmen's tickets of any sort are issued on the Salford tramways.

Sheffield Corporation.—The Corporation of Sheffield does not issue season tickets, and the question has not yet been considered.

Southampton Corporation.—Season tickets are not issued in this city. The committee, in 1900, after making enquiries, came to the conclusion that they could not recommend the Council to issue season tickets.

Southend-on-Sea Corporation.—The Corporation does not issue season tickets. The General Manager has had some past experience of the system of season tickets, and found that it lessens the work of the conductors. He cannot give any figures as to whether

the system of season tickets affects the revenue, but he finds from experience that if "seasons" are not granted on tramways people use the railway. This was also his experience after they were discontinued in North Staffordshire. With regard to the identification of proprietors of "seasons," this is the one weak spot, and one upon which inspectors receive special instruction. Conductors and inspectors notified when new tickets were issued, and numbers quoted. Notice was also given on the expiry of ticket or tickets. Very few of the working classes purchased tickets, but it must be remembered that the prices quoted were rather high. At "rush" hours special provision was made for the prevention of overcrowding. The General Manager strongly recommends the use of "seasons."

Stockport Corporation.—Season tickets are not issued on the Stockport tramways. The General Manager does not recommend them, as he considers that the undertaking is too small, and unsuited for them at present.

Sunderland Corporation.—Season tickets are not issued on this system. The question of issuing these tickets has been considered, but owing to the experience of other towns on horse and steam cars, where it was generally found most difficult to identify the holder of a season ticket, and thus give rise to fraud, it has never been thought advisable to issue season tickets in Sunderland.

Swansea Tramways Company.—Season tickets are not issued by this Company. The directors are of opinion that it would be difficult for conductors to identify the holders, and that private inspection of the conductors would be rendered impossible.

Wallsend-on-Tyne (*Tyneside Tramways and Tramroads Company*).—This matter has been before the directors, but up to the present nothing has been agreed upon for or against the issue of "seasons."

Wallasey Urban District Council.—The question of season tickets has not been considered by the committee.

Warrington Corporation.—The General Manager cannot give any information on the subject. The cars have only been running for a short time, and the committee have decided that before the question of season tickets is considered they would like to have more experience.

Worcester Tramways Company.—No season tickets are issued on this system. The subject was under consideration recently, and

it was definitely decided not to issue them. The Manager is of opinion that if "seasons" were introduced the revenue would be detrimentally affected. The identification of holders of season tickets would be one of the greatest difficulties, and private checking would be rendered practically useless where some of the passengers had "seasons." With the moderate fares at present in operation, the Manager considers that the public are not justified in asking for further reductions. There would be no advantages and many disadvantages. The City of Birmingham Company recently abolished "seasons," and their revenue on certain lines improved.

Wolverhampton Corporation.—No season tickets are issued at the present time on these tramways, and the subject has not been under discussion by the committee. In cases of towns with *not a large* population, the Manager considers it would be much better to sell discount tickets, say, at a saving to the public of 12 per cent.

York Tramways Company.—Season tickets are not issued by this Company. The directors do not approve of them, their idea being that no benefit is gained by the issue of these tickets.

CONTINENTAL.

FRANCE.

Reims Tramways Company.—Season tickets are issued by this Company, price 150 francs per year, and are available over the whole system with the exception of a few sections. The Manager is of opinion that these tickets lessen the conductors' work, but considers they do not increase the revenue. The owner's photograph is attached to all tickets. The tickets all expire on the same date, so that the clerical work in issuing them is reduced to a minimum. The artisan classes do not purchase these tickets. The Manager recommends the use of "seasons," as these tickets make the conductors' duties lighter.

Lyons Tramways Company.—No season tickets are issued by this Company. The question has not been considered, but the directors are of opinion that the adoption of these tickets would be against the interests of the Company.

Paris (*Cie. des Tramways de l'Est Parisien*).—This Company does not issue season tickets, and the Manager has had no personal experience regarding them.

Paris (*Générale Parisienne de Tramways*).—No season tickets are issued on this system.

GERMANY.

Aachen Tramways Company.—Season tickets are issued both for the entire system and for sections. Season tickets on the railways are much cheaper, but no comparison can be made. The Manager considers that season tickets make the duties of the conductor much easier, but the revenue is decreased. The conductor has no means of identifying the passenger unless by personal acquaintance. The system of season tickets is open to abuse, as many people travel who have no tickets, and others use their tickets after the date of expiry. The working classes do not take advantage of these tickets. It is found necessary to put on extra cars on certain sections to deal with the traffic at "rush" hours. The proportion of passengers who purchase "seasons" is 10 per cent. Season tickets can only be recommended in order to secure the patronage of a certain class of people who would not otherwise travel by car.

Breslau Tramways Company.—Season tickets are issued on the Breslau tramways, but for the entire system only.

	£	s.	d.
Price for one year	3	15	0
,, three months . . .	1	0	0
,, one month	0	8	0

A comparison between prices charged on the railway and the tramways can scarcely be made. The conductor's work is not lessened in any way, because if the conductor examines the season tickets properly, which is necessary if fraud is to be detected, his duties will be about the same. In Germany it is almost a univeral condition that a photograph of the season ticket-holder be pasted on the season ticket. In this way the conductor can identify the owner at any time. If a careful watch is not kept on these tickets, they are very often used after the date of expiry. Very few artisans purchase these tickets. The working classes take advantage of cheap fares issued specially for them. Special cars are put on at "rush" hours to cope with the traffic, but the revenue from season tickets does not cover the extra cost thus incurred. In 1902 the receipts from season tickets was 3·26 per cent. of the total revenue. The Manager does not recommend the use of season tickets. In many towns in Germany circumstances have arisen which have led the companies to regret the introduction of season tickets.

Brunswick Tramways Company.—This Company issues season tickets for the whole system and for sections at the following rates :—

6*s.* per month for six sections.
8*s.* per month for eight sections.
12*s.* per month for the whole system.
15*s.* for three months for six sections.
20*s.* for three months for eight sections.
30*s.* for three months for the whole system.

The Manager considers that season tickets make the conductors' duties easier, but that the revenue is very much decreased by their issue. Season tickets must be signed by the owners, but the conductor has no means of identifying them. The Manager is entirely against issuing these tickets. Had they not already been issued, the Company would certainly not have issued them now.

Cologne Tramways Company.—Season tickets are issued by this Company over the whole system, price 10*s.* per month. No "seasons" are issued for certain sections. A comparison with the railway company's charges can scarcely be made, as the railway company does not issue season tickets that are anything like the universal season tickets in use on the cars. The General Manager is of opinion that the conductors' duties are made much lighter on account of the issue of "seasons." He cannot say, however, how the revenue is affected, but he is of opinion that it is decreased. He suggests that the prices of "seasons" be increased. The tickets bear the signature of the holder, and must be produced for examination at the beginning of each month, and also at intervals during the month. No difficulties are experienced in dealing with "seasons." Very few are purchased by the working classes. No difficulty is experienced in carrying intending passengers at "rush" hours. The proportion of passengers who purchase seasons is about 10 per cent. The Manager recommends the use of season tickets.

Crelfeld Tramways Company.—This Company issues season tickets for the whole system and for sections, and the prices are—

10*s.* per month for the whole system.
8*s.* per month for certain sections.
27*s.* per quarter for the whole system.
22*s.* per quarter for certain sections.
50*s.* per half-year for the whole system.
40*s.* per half-year for certain sections.

The Manager considers that season tickets make the conductors' duties easier, and that the revenue is unquestionably increased, as the cheapness and comfort of the street cars cause many to purchase "seasons" who would not otherwise travel by car. If the conductor is in doubt as to the holder of any of these tickets, a signature is asked for. The public, however, do not like producing their tickets. The conductor is satisfied if a passenger says "Season," and this leads to imposition. Very few "seasons" are purchased by artisans. There are special weekly tickets for the working classes. There is no difficulty in dealing with the "seasons" at "rush" hours. "Seasons" are not available on Sundays, when there is most traffic. The Manager strongly recommends the issue of season tickets.

Dresden Tramways Company.—Season tickets are issued by this Company, either for the entire system or for certain sections, for one, three, six, or twelve months. The Manager considers that the work of the conductor is lessened. The photograph of the owner of the "season" is affixed to the ticket, and thus the conductor can identify him. Very few of these tickets are purchased by workmen. The receipts for season tickets amount to 13 per cent. of the total revenue, and at the end of the year 1902, 4570 season tickets had been issued for that year.

Elberfeld Tramways Company.—This Company issues season tickets for the whole system. No comparison is possible with the rates charged by the railway companies. The Manager considers that the work of the conductor is made easier. Holders of "seasons" must be prepared to show them to the conductor on demand. Workmen purchase "seasons" to a fair extent. It is necessary to put on extra cars at certain hours for the convenience of season ticket-holders. The General Manager recommends the use of season tickets.

Great Leipzig Tramways Company.—Season tickets are issued on this system for three, six, or twelve months, for the whole system or for certain sections. Price—

For the whole System—	*For certain Sections—*
2*l.* 5*s.* for three months.	18*s.* to 1*l.* 7*s.* for three months.
4*l.* for six months.	1*l.* 13*s.* to 2*l.* 10*s.* for six months.
7*l.* 10*s.* for twelve months.	3*l.* to 4*l.* 10*s.* for twelve months.

No comparison is possible with the railway charges. Season tickets do not affect the work of conductors in any way. Season tickets are issued at something like half-price, and in this

way the revenue is affected, but this is equalised, inasmuch as the season ticket-holder ensures the revenue during extremely fine weather, when those who would otherwise use the railway take out season tickets, and so the number of direct-paying passengers is lessened. Season tickets are signed by the owners, but the conductor has no other means of identifying them other than becoming acquainted with them by frequent travelling. Very few artisans purchase these tickets. At "rush" hours extra cars are put on to cope with the traffic.

Hamburg Tramways Company.—Season tickets are issued on the Hamburg tramways for the whole system or for certain sections. The Manager considers that the conductor's work is lessened, and that the revenue is cut down to a considerable extent. Artisans do not purchase seasons to any extent. The receipts from season tickets in 1902 amounted to 8·3 per cent. of the total revenue. The Manager is entirely against the issue of season tickets.

Hanover Tramways Company.—Season tickets are issued by this Company for certain sections of the line. The photograph of the owner is affixed to the season ticket, and the tickets must be shown to conductors and inspectors when asked for.

Leipzig Tramways Company.—This Company issues season tickets for the whole system and for certain sections. Price—

For the whole System—	*For certain Sections—*
2*l.* 16*s.* for three months.	18*s.* to 1*l.* 1*s.* for three months.
6*l.* 5*s.* for twelve months.	3*l.* to 3*l.* 10*s.* for twelve months.

These tickets do not increase the work of the conductors. The revenue is adversely affected. Season tickets bear the names of the owners, and the conductors soon know the season ticket-holders, because the card must be produced and shown on entering the car. No difficulties have been experienced in dealing with season tickets. The working classes do not as a rule purchase these tickets. The proportion of passengers who purchase "seasons" is 5 to 6 per cent. of the total. The scale of charges in Leipzig is very low, and the directors do not recommend the issue of season tickets unless the prices be increased to such an extent as to make the price almost equal to the ordinary fare.

Magdeburg Tramways Company.—This Company issues season tickets for the entire system, with the exception of one line which runs to a pleasure garden. No comparison is possible with the rates charged for "seasons" on the railway. The Manager is of opinion that season tickets make the conductors' duties easier.

After several years' experience, the directors find that the prices are far too low. Season ticket-holders only pay about one-third of the regular price. A season ticket-holder must sign his name on the season ticket. Deceptions are frequently practised by season ticket-holders transferring their tickets to non-season ticket-holders, and passengers say "Season" when they are not holders. Very few of the working classes purchase these tickets. About 19 per cent. of the total passengers carried are season ticket-holders. The General Manager recommends season tickets if the conditions are made very stringent, and the prices correspondingly high.

Munich Tramways Company.—Season tickets are issued on the Munich tramways for the whole system and for certain sections at the following rates :—

30*s.* per quarter for the whole system.
15*s.* per quarter for certain sections.

These tickets make the work of the conductor easier. The photograph of the owner is affixed to the season ticket, and by this means the conductor can identify the holder. No difficulties are experienced in dealing with season tickets. Labourers and workmen do not generally purchase these tickets. The rates for season tickets are too low, and the directors recommend that the prices be considerably increased.

Solingen.—Season tickets are issued by this Company for all sections, and the prices are similar to those charged by the railway company. The work of the conductors is, generally speaking, not affected by the issue of "seasons." The General Manager is of opinion that the revenue is unfavourably affected. Season tickets bear the name of the holders, and in cases where there is any doubt the card has to be produced in presence of the police. No difficulties are experienced in dealing with "seasons." Workmen's tickets at specially regulated prices are issued, and a great number of these are sold. No difficulty is experienced in carrying intending passengers at "rush" hours.

Stettin Tramways Company.—Season tickets are issued for the whole system or for certain sections, and can be purchased for one month, several months, or a year. It is hardly possible to compare the rate charged for these tickets with the cost of railway "seasons." The Manager considers that the work of the conductor is lessened. If a great many season tickets were sold the revenue would be considerably decreased. Season tickets have the owners' photographs attached to them, and the conductors experience some

difficulty in inducing the holders to produce them when asked. The working classes do not take much advantage of these tickets. Season tickets have been introduced almost universally in Germany, but the public do not call for them, and the Manager considers that the prices for season tickets must not be made too cheap.

Strassburg Tramways Company.—Season tickets are issued on the Strassburg tramways for the entire system or for sections. Price—

For the whole System—	£	s.	d.
One year, ...	9	0	0
Six months, ...	4	15	0
One month, ...	0	18	0

There can be no comparison made between the prices charged by the railway company and the prices charged by the tramway company, because season tickets on the railway are only given out for long distances, and are calculated by the kilometer. They are consequently cheaper. The Manager considers that "seasons" make the conductors' duties easier. The owners of these tickets object to show them to the conductors, and in this respect they are abused. The working classes generally take advantage of these tickets. Some difficulty is experienced in dealing with the traffic at "rush" hours. Something like 25 per cent. of the total passengers are season ticket-holders. The Manager recommends the issue of season tickets, but not where the rates do not give sufficient returns. He can recommend very few methods of dealing with season tickets.

Erfurt Tramways Company.—No season tickets are issued on this system.

AUSTRIA.

Prague Tramways Company.—Season tickets are issued on this system at the following rates :—

For the whole System—	£	s.	d.
One year, ...	5	0	0
Six months, ...	2	18	4

The Manager considers that season tickets make the work of the conductors easier, and that they do not affect the revenue either way. Photographs of the owners are affixed to all season tickets, and some difficulty is experienced on account of the holders refusing to show their tickets. The working classes do not purchase these, as they are too expensive. There is no trouble in dealing with the

traffic at "rush" hours. The Manager does not recommend the use of these tickets.

ITALY.

Turin Tramways Company.—Season tickets are issued annually, half-yearly, and quarterly on the Turin system for all routes. Monthly tickets for all routes, or for part of a route only, are also issued. This Company is compelled to issue these monthly tickets by the municipal authorities. The Manager is of opinion that season tickets appreciably diminish the work of conductors, but he cannot say how the revenue is affected, as season tickets were introduced many years ago. Each "season" contains the photograph of the owner, and the conductor insists upon the production of the ticket if the owner is not known to him. Once a month all the season tickets are produced in order to ascertain whether any are being used fraudulently. No difficulty is experienced in dealing with "seasons." The working classes do not purchase these tickets. Special workmen's tickets are issued in the early morning, at five centimes each. There is no difficulty in dealing with intending passengers at "rush" hours. About 1000 annual season tickets have been sold.

DENMARK.

Copenhagen Tramways Company.—No season tickets are in use in Copenhagen.

SWITZERLAND.

Zurich Tramways Company.—Season tickets are issued on the Zurich tramways for the entire system. Price—

1l. 5*s.* per quarter.
2l. 10*s.* per half-year.

The Manager considers that if the checking of these tickets was conscientiously carried out it would make the conductors' duties much heavier, and he is of opinion that "seasons" have an injurious effect on the revenue. Season tickets contain the photograph of the owner, and are mostly purchased by business people. Very few are issued to the working classes. The Manager does not recommend the use of seasons," as they decrease the revenue, and they have a tendency to make the conductors become very careless in the discharge of their duties.

BELGIUM.

Liège (D'Enterprise Générale de Travaux).—No season tickets are issued on this system.

MEMORANDUM.—ABSTRACT OF INFORMATION RECEIVED FROM RUN IN CONNECTION

Inserted by kind permission of J. B. Hamilton, Esq.

Name of Town.	Do you grant any Fares at Less than Ordinary, as per above?	If so, whether by specially Reserved Cars in the Morning or Evening, or both.	If on Ordinary Cars, whether on the whole of the Car or on part thereof.
ABERDEEN . . .	No.	..	..
AYR	Yes.	Both.	Top deck only in evening, but any part in morning.
BIRMINGHAM TRAMWAYS CO., LTD.	Yes.	No.	Whole.
BIRKENHEAD . .	Yes.	No.	Whole.
BLACKPOOL . . .	Yes.	No.	Whole.
BOLTON . . .	Yes.	No.	Whole.
BOURNEMOUTH . .	Yes.	Yes, both. (Marked "Workmen's Cars.")	Whole.
BRADFORD . . .	Yes.	..	..
BRIGHTON . . .	No.	All fares were originally fixed very low, viz.:—at so that ordinary fare is a cheap fare on	
BRISTOL . . .	Yes.	Yes, both.	..
BURNLEY . . .	Yes.	Two Cars reserved to comply with Act.	Whole of Ordinary. After 2.30 p.m. for colliers and "rained off," outside only.
CARDIFF . . .	Yes.	Morning and evening.	..
CHATHAM . . .	Yes.	a.m., noon and p.m.	Whole.

THE UNDERMENTIONED TRAMWAY UNDERTAKINGS AS TO CARS WITH WORKMEN'S FARES.

November, 1903

At what Hours.	If Tickets are in use, by Special or Ordinary Ticket.	Average Distance.	Do you Restrict them to Artisans, Mechanics and Daily Labourers?
..	..	..	..
5 to 7 a.m. and 4.30 to 6.30 p.m.; Saturdays, 12.30 to 2.30 p.m.	Special.	1½ miles, ½*d.*	Yes.
Return tickets issued between 5.30 and 7.30 a.m.; available for return after 9 a.m.		3½ miles, 1*d.*	No.
Workmen's tickets are issued to all passengers on all Cars leaving any terminus up to 8 a.m. Single fare, 1*d.*; return, 2*d.* The 2*d.* ticket entitles holder to return by any Car on any route on any day (Sunday excepted).			No restrictions.
Any time.	In season, minimum fare is 2*d.* Tickets are sold at 1*s.* per dox. In winter fares are reduced, and no demand for workmen's tickets.	..	Labouring classes only.
Before 7.30 a.m.	Return tickets and special weekly workmen's tickets.	1½ miles, ½*d.*; and 2½ miles for 1*d.*	No, but greater facilities granted if successful in application for Weekly Workmen's Form.
Until 8 a.m. and in evening. Saturdays between 12 and 2 p.m.	Special.	½*d.* per mile.	Yes. Every endeavour being made to so restrict them.
Before 8 a.m.	No tickets.	3 miles 1*d.*	All passengers before 8 a.m. treated as workmen; in evening, yes.
·66 of a Penny per mile, all routes.	..	..	..
In time for various large works after 1 p.m.	Special.	1½ miles, ½*d.* 3 miles, 1*d.*	Labouring. (Male and female.)
Until 8 a.m., 12 to 1.30 p.m., and 4.45 to 6.45 p.m.; Saturdays same, except not after 1.30 p.m., exceptions in favour of colliers and "rained off" workmen from 2.30 p.m.	Special.	..	Yes, but including females.
5 to 7.30 a.m.: 4 to 7 p.m.; Saturdays, 11.30 to 2 p.m.	Special.	3 miles, 1*d.*	Yes.
5.45 to 7.15 a.m.; 12 noon from work and 1.15 p.m. to work, 4.30 from work; 5.45 till 7.15 a.m. (Saturdays), and 12 noon from work.	Special.	Any distance, longest distance 4 to 5 miles.	Yes, as per the terms of the Act.

MEMORANDUM.—ABSTRACT OF INFORMATION RECEIVED FROM RUN IN CONNECTION WITH

Name of Town.	Do you grant any Fares at Less than Ordinary as per above?	If so, whether by specially Reserved Cars in the Morning or Evening or both.	If on Ordinary Cars, whether on the whole of the Car or on part thereof.
CROYDON . . .	Yes, on two routes only.	Evening, marked "Workpeople's Car."	Whole.
DARWEN . . .	Yes.	No.	Whole.
DOVER . . .	Yes.	Evening only.	Not on ordinary Cars.
DUBLIN UNITED . .	Yes.	Only morning.	..
DUNDEE . . .	Yes.	No.	Whole in morning; outside only in evening.
EAST HAM . . .	No.	A number of extra Cars are run a.m. and p.m. to meet workmen leaving works. (Not specially reserved.)	Whole.
HALIFAX . . .	No.	..	..
HUDDERSFIELD . .	Yes.	Reserved, both morning and evening.	Whole.
HULL	No. 1*d.* any distance from centre of City.		
ILKESTON . . .	No. Ordinary fare, 3 miles, 1*d.*		
LIVERPOOL . . .	No. All ordinary fares are based upon a rate, which is lower than		
LONDON COUNTY COUNCIL . . .	Yes.	No.	Whole.
MANCHESTER . .	Yes.	1 Special Car run on each route in the evening.	..
NELSON	Yes.	No.	Whole.

THE UNDERMENTIONED TRAMWAY UNDERTAKINGS AS TO CARS WORKMEN'S FARES—*continued.*

At what Hours.	If Tickets are in use, by Special or Ordinary Ticket.	Average Distance.	Do you Restrict them to Artisans, Mechanics, and Daily Labourers?
Leaving termini up to 7.30 a.m. 5.15 to 6.18 p.m. Saturdays, 12.5 to 1.20 p.m.	Special.	2½ miles, 1*d.*	No.
5 to 7 a.m. and 5 to 6 p.m.; no special noon service on Saturdays.	Special.	3 miles, 1*d.*	Yes, but have had great difficulty in dealing with persons not *bonâ-fide* endeavouring so to travel.
5.30 a.m. to 8.30 a.m.; 5 to 6 p.m.; Saturdays, 12 to 1.30 p.m.	Special (one journey).	2 miles, 1*d.*	Only in the evening.
5.30 a.m.	Special.	½*d.* per mile.	Yes. *Bonâ-fide* Workmen only entitled.
5 to 7 a.m. and 5 to 6.30 p.m. (from November till March: 4 p.m. till 6.30 p.m.); Saturdays, 12 to 2.30 p.m.	Return.	Workmen can travel 9½ miles one way and return with same ticket for 1*d.*	Yes. (Females included.)
..	Ordinary.	½*d.* per mile.	No. 82% of passengers are ½*d.* fares.
..	..	..	..
5 to 8 a.m.; 5 to 7 p.m.; Saturdays, 5 to 8 a.m. and 12 noon to 2 p.m.	Ordinary.	2½ miles, 1*d.* 3½ miles, 1½*d.* 5* miles, 2*d.* *One section only.	Yes.
..	..	..	..
..	...	..	..
the statutory rate for such tickets.		..	..
8 a.m. to and from the bridges.	Special Return.	6 miles, 1*d.*	No.
Before 7 a.m.; 6 p.m. from the City; Saturdays, mornings only, before 7 a.m.	Special.	2·1364 miles, 1*d.* 4·196 miles, 1½*d.* 4·243 miles, 2*d.*	No restriction.
5.30 to 8 a.m.; 12 noon to 2 p.m.; 5.30 p.m. to 7.30 p.m.; Saturdays, 11.30 a.m. to 1.30 p.m.	Special. 4½*d.* a doz., ½*d.* each.	½ mile, ½*d.*	Yes.

MEMORANDUM.—ABSTRACT OF INFORMATION RECEIVED FROM RUN IN CONNECTION WITH

Name of Town.	Do you grant any Fares at Less than Ordinary, as per above?	If so, whether by specially Reserved Cars in the Morning or Evening, or both.	If on Ordinary Cars, whether on the Whole of the Car or on Part thereof.
NEWCASTLE . .	Yes.	Evening only.	Whole.
NEWPORT . . .	Yes.	No.	Whole.
OLDHAM . . .	Yes.	No.	Whole.
PORTSMOUTH . .	Yes.	Both.	Whole.
ROCHDALE . . .	Yes.	Special Cars, morning and mid-day. (Ordinary Car turned wholly into Workmen's Car in evening.)	Whole.
SALFORD . . .	Yes. In morning only.	No.	..
SHEFFIELD . . .	No. (Maximum fare is 1*d.*, from City to any terminus.)	..	..
SOUTHAMPTON . .	Yes.	Yes. (Evening only.)	Outside only of ordinary Cars.
SUNDERLAND . .	Yes.	Yes (morning.) Ordinary Service Cars in evening, labelled "Workmen's Cars."	Whole.
WALLASEY . . .	Yes.	No.	Whole.
WEST HAM . . .	Yes.	No.	Whole.
WIGAN . . .	Yes.	No.	..
WOLVERHAMPTON .	Yes.	No.	Whole.

THE UNDERMENTIONED TRAMWAY UNDERTAKINGS AS TO CARS WORKMEN'S FARES—*continued.*

At what Hours.	If tickets are in use, by Special or Ordinary Ticket.	Average Distance.	Do you Restrict them to Artisans, Mechanics, and Daily Labourers?
Before 7 a.m.; 4.30 to 5.30 p.m.; Saturdays, 12 to 1 p.m.	Ordinary.	1½ miles, ½*d.*; 3½ miles, 1*d.*; any distance, 3*d.*	Yes, except in morning.
5 a.m. to 8.15 a.m.; 5 p.m. to 6.30 p.m.; Saturdays, 12 to 2 p.m.	Ordinary.	2½ miles, 1*d.*	Yes, except in morning.
5 and 6.30 a.m.; 5 and 6 p.m.; Saturday, 12 and 1 noon.	Ordinary.	2·64 miles for 1*d.*	No. Workmen can travel whole length of any route, 1*d.* between the times stated.
Before 8.45 a.m. and after 4 p.m.	Special section on ordinary tickets for the single fare in the morning, and special ticket for the return fare, for which an exchange ticket is given.	2½ miles, 1*d.*	No.
Morning, mid-day, and evening.	Special.	½*d.* per mile.	Yes, as per Bye-laws; but this cannot be carried out thoroughly.
Up to 7 a.m.	..	..	No.
..	..	..	..
5 to 7.30 a.m.; 5 to 6.15 p.m.; Saturdays, 1 to 2 p.m.	Ordinary.	Any distance up to 4½ miles, 1*d.*	Yes, in the evenings and mid-day Saturday.
5 to 7.30 a.m.; 5 to 6 p.m.; Saturdays, 12 to 1.15 p.m.	Special.	Any distance, 1*d.* 4 miles maximum.	Yes, as far as practicable.
5.15 to 7.45 a.m., returning any time after 4 p.m.; Saturdays, returning 12 to 7 p.m.	Special through return tickets.	6·2 miles for 2*d.*	Yes, nominally.
Return tickets are being issued experimentally on one route only, on journeys prior to 7.30 a.m.		3½ miles, 1*d.*	Yes.
All passengers up to 8 a.m. can purchase return tickets, any distance, 2*d.* Return by any Car.		2 miles, 1*d.*	No.
Ordinary workmen's hours. After 1 o'clock Saturdays.	Special.	2 miles, 1*d.*	Yes. No females.

In carefully perusing and studying these reports, it strikes one very forcibly, as regards the different ideas, opinions and results arrived at by different managers and committees. Everything seems complicated, with no approach at unanimity as regards either for or against the adoption or otherwise.

Some report from experience, and others report without having any experience. There is no unanimous decision appertaining to any single one of the questions asked in these reports. Taking the report on the subject of workmen's tickets, some grant fares less than the ordinary, and others do not; some have specially reserved cars for workmen, and others do not; some allow them to travel only on the top of the cars, others on the whole, others not on ordinary cars at all; some on the top deck only in the evening, but on any part in the morning, etc.

There is no approach at uniformity as regards the hours allowed for workmen's fares. Some issue special tickets, some issue return tickets, some no tickets, and yet others use the ordinary tickets; there are tickets sold singly, return, and by the dozen.

Taking the average distances, these vary greatly, although this of course is evidently due to local conditions as regards different lengths of routes, etc. Regarding restrictions, some do and others don't; others do not restrict in the morning, but do so in the evening. Some restrict nominally, and others as far as practicable; some allow labouring classes only, and others with *bonâ-fide* workmen only.

Now the author would like to know how are you going to distinguish between the different classes of passengers, whether they are *bonâ fide* or not, labourers or not? How can labourers be distinguished from workmen, and *vice versâ*? Is not a workman a labourer, and *vice versâ*?

It is not possible for either tramway managers or committees to distinguish between classes of workmen; you have to be ruled by what is in the broad legal sense meant by "workmen." Only recently, by a decision of the stipendiary magistrate in Leeds, it has now become impossible to limit the action of these cheap fares to distinguishing classes of workmen.

Now, assuming that circumstances came about, such that one or more or several tramway systems should be so advantageously placed and interlinked, that they desired to cater for the "interchange" of passenger traffic, just imagine the complications which would arise by not having some system of uniformity in the traffic organisation as regards the above problems.

Regarding these questions, the British tramway undertakings are certainly in the embryo state. There are no well-defined lines, or system of uniformity, on which the organisation or running is based. This is due to the lack of extensive experience, taking the undertakings as a whole.

In fact, the majority of them appear to be experimenting with the most complicated methods of running their systems; and fail to approach simplicity, which is so essential for the mutual benefit of all concerned.

In addition to the aforementioned list of reports, C. R. Bellamy, Esq., general manager of the Liverpool Corporation Tramways, kindly informs me that they do not issue special workmen's tickets, as all ordinary fares are based upon a rate which is lower than the statutory rate for these tickets. They also do not issue contract tickets, but, for the convenience of large employers of labour, etc., they sell penny section tickets in packets of 60, price 5*s.* each.

Arthur Ellis, Esq., tramways manager, of Cardiff, kindly informs me that they run special cars morning and evening, the number of cars being 25 which are allocated to this purpose.

Workmen are allowed to travel any distance for 1*d.*; and special workmen's tickets are issued. The reduced fare, however, is limited to workmen only; and other passengers wishing to travel on these workmen's cars have to pay ordinary fare.

Workmen are limited to travel only upon these particular cars at reduced fare, and if they travel on the ordinary car they have to pay the ordinary rate of fare.

There is no system of "season" tickets in operation on their system of tramways.

J. B. Hamilton, Esq., general manager of the Leeds Corporation Tramways, kindly informs me that they grant cheap fares to workmen, i.e. artisans, mechanics and daily labourers, from the first car in the morning to 8.45 a.m., leaving any terminus, and on the outside of all cars between 5 and 6.15 p.m.

The fares are 1*d.* between the centre of the city and

any outside terminus, or any two ordinary consecutive 1*d.* stages for 1*d.* In some cases this penny fare carries a workman a distance of 5½ miles, and the average is about 3¾ miles.

No special tickets are issued for workmen, but the ordinary ticket is punched forward.

By a decision of the stipendiary magistrate in Leeds just recently, it has now become impossible to limit the action of these cheap fares to the classes of workmen referred to; and consequently the committee are at present considering an extension of the ordinary fares, so that the ordinary fare will be equal to the fare which Parliament requires shall be the minimum charged to workmen, viz. two miles for 1*d.*

They do not issue season tickets, all their ordinary fares being very low.

C. J. Spencer, Esq., general manager of the Bradford Corporation Tramways, kindly informs me that they have no elaborate schemes for workmen's fares and season tickets.

Before 8 a.m. each car travels from the centre, outwards and *vice versâ*, at a universal fare of 1*d.* with no return tickets. On this system the longest possible ride on their tramways for a 1*d.* would be about 5 miles, but inasmuch as the Leeds tramways has a similar arrangement, it is possible to ride from the centre of Bradford to the centre of Leeds, or *vice versâ*, before 8 a.m. for 2*d.*, a distance of about 10 miles. (The author considers the above arrangement a common sense order of things, which is no doubt to the mutual benefit of the two tram-

ways corporations and the community at large; here is an instance of "harmonious combination" which the author strongly advocates.) They have no season tickets, or passes of any description.

The present system of passenger traffic fares on electric tramways has been brought about by endeavouring to make concessions and improvements on the old horse tram-car methods.

They have taken as a basis of their operations the system of penny stages, in combination with the principle of workmen's fares and season or contract-tickets system of large railroads; or, in other words, the electric tramways have adopted the old obsolete system of penny (and fractional penny) stages of the horse haulage system in combination with the "broad minded" up-to-date system of "season" and "contract" tickets of extensive railroads, with the result, that instead of adopting a "universal" up-to-date simple method (suitable and applicable to electric tramway systems), they have instead, one full of complications to everyone concerned.

It complicates the conductors' duties, complicates the tramways accounts and bookeeping, similarly the traffic superintendent's duties, the general manager's, etc.; and, in addition, gives one section of the travelling public, "privileges" over another section by such reduction of fares.

In addition to the above, they have obtained some of their ideas from knowledge gained of the "season ticket" and other methods used on the Continent.

Now electric traction systems (each town or corpora-

tion of which works its own undertaking), with their extreme limits of distance confined to a comparatively few miles, are not under the same working conditions as large railroad companies, whose distances approach several hundreds of miles.

Under such circumstances, whereas "season" and "contract" tickets are specially applicable, and are a source of "profit" to large railroad undertakings, they are neither "practical" or "commercial" for "electric tramways" (i.e. electric tramways confined to local limits such as towns, cities, etc.), for that reason alone "season tickets" should not be adopted by tramways.

There are no "season tickets" used in America on the tramways, but "season tickets" are generally adopted on the Continent.

Regarding "passenger-traffic fares" there are two entirely different and distinct systems. There is the "American" system used all over the United States, with its "universal" 5-cent fare; this means that you can travel any distance you like over their system for 5 cents (2½*d.*).

You have to pay 5 cents whether you travel, say, only ¼ mile or 20 miles. On the Boston Elevated Railway Company's system there are a number of long rides varying in length from 15 to 17 miles and upwards.

This system is analogous to the Post Office plan of charging 1*d.* postage whether a letter is carried one mile or several hundred miles.

The other system, which is in vogue in Great Britain and on the Continent, is called the "Zone system," which

is a system of charging fares according to distance travelled; these distances are set out by "stages," and the fare is generally 1*d.* for each "stage," although there are ½*d.* stages.

The great difference between the two systems is, that in one (the "American") the system of organisation is brought down to its simplest form, which simplifies the working of the entire undertaking from beginning to end.

While in the "Zone system," everything seems to be so organised that it is complicated from beginning to end.

The only "disadvantage" in the working of the "American" system is, that where passengers have to change cars at junctions or "stages" along the route, to get another car to proceed in a different direction, there has to be established at these places what are known as "transfer stations," where the passengers obtain (free of charge) transfer tickets, to allow them to continue their journey to where they require to go—after having paid their fare once and for all at the beginning of their journey.

This could be readily overcome by giving transfers on the cars, only this latter method is too slow for the Americans, and they prefer the method of collecting the fares quickly on the cars, with transfer stations. Another disadvantage on the "transfer station" system is, that there is a chance for fraud by dishonest persons getting transfers to travel on the cars who have not travelled by a car previously. However, the Americans

are fully alive to this, and the passengers are carefully watched; the "transfer" men stand close to the exits of the cars, and you get your "transfer" as you get off—if they don't see you get off the car, it is likely you will not get your "transfer."

In some "surburban town" tramway systems in America, transfers are given on the car, by the conductor.

To prevent transfers being used, in the afternoon or evening, which were issued say in the morning, the transfers have printed upon them the different "clock times" of the day (in 15 minute intervals), and the transfer man punches a hole in the ticket opposite the time at which it is issued (i.e. the time the car arrives at the transfer station); the ticket has then to be used at once. This prevents fraud.

Even with the above disadvantages, the advantages which such a system possesses certainly make it preferable, from the author's experience and knowledge of the two systems.

They are not troubled with the questions of season and workmen's tickets, or making any concessions or privileges for any one section of the travelling public.

Due weight and consideration should be given to the "American" system, because it is used with great success (both practical and commercial) by large undertakings who have had a much more extensive experience in electric traction than similar undertakings in Great Britain.

The argument sometimes used against this system,

is hardly applicable, where it is claimed that they get 2½*d.*, while in England it is 1*d.*, because in the United States 2½*d.* has practically only the same value as 1*d.* in this country.

Even if the 2½*d.* and 1*d.* did possess proportionate values in both countries; that whereas on the "Zone" system, the "short distance" traveller in 1*d.* "stages," has the advantage, still when he comes to travel longer distances, say of 10 or 15 miles, he is greatly at a disadvantage, compared with the "universal" system, having to pay probably "double" or "treble" what the American does. It is merely a condition of "averaging" where things very nearly balance.

In any "tramway system" the more concessions you make in part—such for instance as workmen's tickets, seasons tickets, ½*d.* stages, 1½*d.* stages, 1*d.* stages, return tickets, etc., altering the length of stages and splitting the system up into sections, different cars for various classes of passengers, etc.—so do you complicate more and more the working and organisation of your system.

In addition, the public are never satisfied. Some classes of the public want and complain that they do not get equal privileges with other classes, either as regards fares, distances travelled, types of car, or time-service. By eliminating as many as possible of these conditions for complaint and dissatisfaction, you lighten your duties so much for the common welfare.

Herein lies one great advantage of the "universal" fare system, in its extreme simplicity and entire freedom

from the majority of the above-named defects and complications.

Based on the experience which the author has had of both the "universal" and "Zone" systems, he does not believe (in the case of large tramway undertakings in towns and cities with a large passenger traffic, such as Manchester, Liverpool, Glasgow, London, etc.) in "season" tickets, "workmen's" tickets, return tickets, or the system of charging fares in "stages" (especially where fractions of a penny are involved).

Under no circumstances whatsoever does the author believe in, or advocate ½*d.* fares, although advocating cheap fares there is a practical limit to such, in his opinion this limit being 1*d.*

He believes in, and strongly advocates a "universal" penny fare as being the "ideal" system from a combination of every point of view, for the mutual benefit of all concerned; he does not see where it would be less "commercially" successful or to the financial detriment of tramway undertakings.

Conditions would "average" up for the "commercial" success of the undertaking. We would get this "average" because ½*d.* stage passengers would have to pay 1*d.*, and likewise the 2*d.* ones 1*d.* The traffic would increase, because there are certain passengers who live at such distances that rather than pay 2*d.* they walk; whereas, if they could travel the whole distance for 1*d.*, they would ride.

Of course, these passengers now can travel to the end of the first stage for a penny and walk the rest of the

distance, but there are a great number of people who would just as soon walk the whole distance as part of it.

If looked at from the point of view, that the most logical and equitable arrangement is to give the benefit of any surplus profits to those from whom it is directly derived—the passengers—then this is also an argument in its favour.

Reduced fares, a better service, extensions to outlying districts—in such ways the undertaking may be made an invaluable social factor, and yield only such a surplus as the future contingencies of the system demand.

If this "universal" penny system is adopted for passengers to travel over any part of the system, then a system of "transferring" becomes necessary. This could readily be done in England by the conductors on the cars giving transfers, instead of adopting transfer stations, especially where single deck cars are in use.

In the case of suburban town systems, which do not need large cars, with no heavy passenger traffic the "conductor transfer" system is applicable. But in large cities with "heavy" passenger traffic, especially during "rush" hours, the above is not so applicable.

There is an "alternative" system, to prevent the necessity of adopting transfers. It is not quite so broad or extensive in its range as the previous system, and that is, a "universal" penny system in any one direction on the same car; they could travel part or whole distance by that car, but if they changed cars to go in

another direction they would have to pay another penny. This system is simpler than the previous one; and in the author's opinion, is the method that it is advisable to try first.

In the author's opinion it is only a matter of time before the "universal" penny system will be adopted in England; in fact, they are moving towards it gradually, for the reason that they are already making concessions as regards workmen's tickets, reducing the fares of stages, increasing the length of stages, etc. etc. This is the path which leads to it; only, instead of adopting the system as a whole and at once, they prefer to go through the experience of seeing by what roundabout, complicated and unstable methods they can get there. The "universal" penny system is eventually their goal, and it is only a matter of time.

Of course, in the case of a "surburban tramway" system, especially when the conditions are long distances and "light" passenger traffic, the "universal penny" system would not lead to "commercial" success; the fares in such a case would be determined by conditions.

Under circumstances, where running powers exist for different corporation tramway systems to run cars over each other's lines, the "universal penny" system would still be applicable; it could be limited to the boundary lines of each corporation system, then pay another "penny fare" to take one anywhere on the other company's lines, this would form a good simple basis, on which each undertaking could get their proper share of receipts.

In America, as a general rule, such running powers over each other's lines do not exist, they interlink the systems, by running to "termini," and where one company ends another begins; under such conditions you pay 5 cents on one system, get off the car and then pay another 5 cents on the next system, and so on. This certainly has the advantage of "simplicity" of organisation, preventing complications that might possibly arise due to strikes, disagreements about fares, maintenance of permanent way, accidents on each other's lines, expensive litigation, etc. In America tramways are run as private enterprises as a general rule, and not as municipal undertakings.

Since writing the above lines, the Tramways Committee of Huddersfield has altered previous arrangements with regard to workmen's cars, and is now issuing return tickets, which are available on all cars arriving in Huddersfield at or before 8 a.m., the return journey to be completed on the upper saloon between 5.30 and 7.30 in the evening, and 12 and 1.30 on Saturdays.

In addition, a statutory workmen's car is being run on each section where the fares demand such a concession.

(Here again there is changing about and experimenting, which tends to substantiate the author's criticisms and remarks on the above problem. There is a weak point in the above arrangement, due (1) to time element; (2) Complicates conductors' duties; (3) Distinguishing workmen; (4) Special cars; (5) Privileging one section of the public over another section.)

Collecting of Fares and Inspection of Tickets.

In the methods of collecting and registering passengers' fares, the system generally adopted in America is for the conductor to collect the fare and pull a cord which works an automatic self-registering clock. There are no "way-bills" or inspectors in uniform.

The clock registers the number of fares collected, and at the same time clicks, so that the register is heard as well as seen. The clock is set at zero at the beginning and end of each journey; and, when the conductor arrives at the end of his journey, he makes a note in his book as to how many fares were registered, and then turns the pointer back to zero; his number of fares must, of course, correspond with the number of fares registered by the clock.

The clock registerings are checked by a "checker" at the terminus of the route.

There are no ticket examiners, and this leaves a loop-hole for fraud, as there is no check on the conductor, for he can collect fares and not register them; also there are no numbered tickets whereby he can be checked.

In place of uniformed inspectors, whose duty it is to see that the conductor performs his work satisfactorily and misses no fares, there are private clothes "detectives," who are technically known as "spotters" (an American word), whose duty it is to see if the conductor does any cheating for the benefit of his own pocket.

The conductors do not know these "spotters" or

when they are on the car, so he is liable to be watched unawares.

They pay their fares same as ordinary passengers and have to make a note of the cars they have travelled on, number of conductor, time of day, etc.

This is rather an unfair method, because it gives the conductor absolutely no protection whatsoever; he has no numbered tickets or way-bills to prove his case, and the "spotter's" word against him means his discharge.

There is great injustice in this method of inspecting, for the reason that if a "spotter" has a grudge or personal animosity against any conductor, he can use it for malicious purposes to suit his own ends, and do the man an injury both financially and as regards character.

This is a weak point in the system, and for that reason the author strongly condemns the method.

The "American" system of collecting fares, however, has one meritorious advantage, and that is, it is more speedy than the English method.

The method adopted of collecting the fares in the "subway" (underground tramways) of the Boston Elevated Railroad system, is to have turnstiles; and as the passenger goes through the stile he pays his fare, for which he is given a ticket issued in the subway—this ticket is given to the conductor of the car, as his fare, which he registers as a fare, as though he had actually paid him the five cents in money.

When he gives his money for fares to the cashier, he also gives in the "subway tickets," and he is credited with them as fares.

This "subway" system is very good, as it prevents the subway station platform from being filled with loitering non-passengers; there is thus no overcrowding of the platform due to this cause, which tends to prevent accidents due to such overcrowding.

The English method of collecting fares is much preferable to the American system (although somewhat slower and not quite so simple).

The "system" almost universally adopted in England is the "ticket" and "bell-punch" method. The tickets have the destination places printed upon them, opposite to which the conductor punches a hole with his "bell-punch."

The "tickets" are numbered consecutively and he starts out on his journey or day's work with a certain quantity of tickets for different stages along his route; these different stage tickets are generally of different colours, so as to be easily distinguished.

In addition to the tickets, the conductor (as a general rule) has given to him for change, a sum of 3*s.* 6*d.*, in the form of three sixpences and 2*s.* in copper; he accounts for these (in addition to his fares) at the end of each journey, and starts each journey with the same change as above.

A note is made of the quantity of each kind of ticket and their numbers by the cashier or person who supplies them to him, also the conductor himself makes a note of what he receives in his way-bill book.

His fares for the different stages have to correspond with the number of tickets sold, which is easily traced by

the number of tickets he takes out and brings back; he also makes a note on his "way-bills" of the number of tickets at the beginning and end of the outward journey, also on the return or inwards journey.

There is a check kept on the conductor, by means of uniformed inspectors of tickets, who are liable at any time and at any part of a journey to board the car and inspect the passengers' and conductor's tickets.

He inspects the number of the ticket which the conductor has recorded on his journey way-bill at the beginning of that journey; also looks at his tickets and sees the number of the last ticket sold; he then inspects each of the passengers' tickets (which has to be shown on demand, or else pay the fare), all the numbers of which must correspond to the numbers between the first and last ticket sold on that journey. This prevents anyone riding with a ticket that has been used before, the number of which would not, of course, come between say 2003 (the first ticket sold) and 2055 (the last ticket sold); for instance, if his ticket number was 1950, he would be riding with a ticket which had been used on a previous journey.

If the inspector finds a passenger who has no ticket he quietly informs the conductor, who then collects his fare. The inspector makes a record in his book of the car and conductor and the numbers of the tickets. This is a splendid system of checking both the conductor and the passenger.

Some English tramway systems, in addition to having inspectors in uniform, have the private clothes

"spotters," who pay their fares the same as an ordinary passenger. There are a few electric tramway undertakings who collect the fares in the old fashioned "penny-in-the-slot" boxes. This method is handed down from the "horse-tramway" system, but it is too historical and obsolete to ever be adopted by an extensive up-to-date electrical undertaking.

While the American method, as above described, is probably quicker and somewhat simplifies the book-keeping of that branch of the tramway accounts, it places no check whatsoever on the conductor and passengers. Without doubt, the English system is the better; the system of "checking" both conductor and passenger approaches perfection; there is absolutely no loop-hole for fraud, and the system generally is based upon a more solid and substantial principle.

Advertisements in Electric Cars.

While the American undertakings realise and are fully alive to the commercial and profitable advantages of allowing advertising in their cars, the English undertakings, generally, are rather backward in taking advantage of the golden opportunities offered, whereby there is awaiting to be placed in their pockets money; in return for which they have to do no work or take any risk.

They get paid for a "privilege," which extensive undertakings are, in some instances, failing to avail themselves of.

The author knows, from personal knowledge, that

more than one undertaking has found that the "acceptance" or "refusal" of these glorious opportunities has meant the difference between "profit" and "loss" on their year's working—the difference between "commercial success" or "financial loss."

Tramway undertakings who are making good profits out of their traffic, are not forced by circumstances to look around them to see by what means they can increase their financial returns; and no doubt, for that reason, do not look into the subject or give it the thoughtful consideration which it deserves.

But other undertakings, which are so placed and are working under conditions where things are so finely worked that the total expenditures under all the several headings, and the total receipts year by year, closely balance, with sometimes a profit and sometimes a loss, are forced to look around them to see what improvements can be made financially.

These are the people who realise opportunities offered them for their financial benefit, which opportunity they generally take advantage of.

Now, for the reason that (when a proper method of advertising is adopted) there is no necessity for any expenditure outlay on the part of the tramway undertaking, also it is not detrimental to the cars, also no risk on their part, it cannot be otherwise than a source of profit to them.

There is not a substantial argument which can be used against advertising in the cars; the chief complaint which is heard from time to time is, that some passengers

offer objections to travelling in cars with advertisements therein.

What common-sense reasons these complaining people can offer to explain themselves, the author has never been able to fathom, and their case can be cast aside, as being one of imaginary grievances.

The duty of the management is to provide passengers with common-sense conditions of travelling, such as safety, good ventilation, comfort, civility, cheap fares, long rides, and a good service generally. To a great extent here their duty ends ; and when it comes to such a state of affairs that a comparatively small proportion of a travelling public, offer such frivolous objections as they sometimes do to advertisements, and expect that all their whims and caprices are to be catered for (when it is to the financial interests of the undertakings to adopt advertising), then it is the duty of "managers" and "committees" to educate these people to a common-sense condition of things by adopting what is for their own commercial benefit.

Advertising in street cars does not interfere in any way whatsoever with the aforementioned conditions or duties so essential to a well-organised passenger traffic.

The author is a strong advocate for any conditions or opportunities which are of "financial" advantage to electric tramways, providing, of course, that they do not interfere with the aforementioned conditions so essential for the well-being of passengers, or which is not detrimental to the rolling stock in any way.

There are "two" methods of advertising as regards

organisation. One is for the tramways undertakings to do the business themselves. In this system they take all risks, responsibilities, canvassing for advertisements, fixing the advertisements in the car, keeping records of them, closing contracts, receiving all moneys from them, paying the bills for debts contracted in different parts of the business, etc.

The author strongly condemns this method because: (1) It is too much trouble, risk and responsibility. (2) Complicates the organisation of the undertaking by adding another separate business as an offshoot to what is already a special and complicated organisation. (3) Tramway organisation is one business, advertising is an entirely different and distinct business, it has been brought down to a fine art and to be successful demands great experience; tramway undertakings are not experienced in the business. For these and other reasons advertising carried on by themselves is best left alone.

Then, again, the object of "tramways" should be to simplify their organisation, and not complicate it by bringing in foreign elements.

The second method is to let out the "privilege" of advertising on their cars by "contract" to a responsible business house who make a speciality of it.

The "contract" can be on a basis of so much "per car" (which is the best and simplest arrangement), or any other mutually beneficial arrangement which might suggest itself and be agreeable to both parties.

In this "letting by contract," the contractor generally takes all risk, responsibility, fixing of advertise-

ments, etc.; the undertaking having nothing to do but grant the privilege, receive and sign the contract, and receive the financial consideration, for which they are put to no expense.

They are paid for a "privilege" which is a valuable "asset" to an extensive undertaking.

The author advises the adoption of this method of advertising, which is the one generally adopted throughout the United States, and in some cases in Great Britain.

There are several extensive tramway systems in England (Leeds, Liverpool and others), who allow advertising in their cars; but it is rather surprising that such an extensive and enterprising undertaking as the Manchester Corporation Tramways should not have adopted it.

Assuming that they have at least 500 cars, and the "privilege" was let at 20*l.* per car per annum, this would mean an annual income of 10,000*l.*, which would purchase about sixteen or seventeen new cars per annum at say 600*l.* each.

Relating to advertising, J. B. Hamilton, Esq., general manager, Leeds Corporation Tramways, kindly informs me that, "We let out our advertising at so much per car, and as we get about 20*l.* per car per annum, we find it very profitable.

"It is very tastefully and well done by the present contractor, Mr. J. W. Courteney, who takes the sole risk, attends to the boards and everything else.

"We do not allow any printed advertising cards

inside the cars, but have coloured glass plates nicely finished in the small upper panels."

C. R. Bellamy, Esq., general manager, Liverpool Corporation Tramways, kindly informs me that, "With regard to advertising on tram cars, we let the sole rights in this matter out by contract, subject to restrictions as to size, type and positions of advertisements.

"The latter consist of enamelled iron plates for outside and coloured glass for inside, of approved tints. The contractor pays a fixed rate per car, per annum, for his privileges."

Arthur Ellis, Esq., general manager of the Tramways, Cardiff, kindly informs me that, "We do not allow advertisements, as we believe they disfigure the cars by plastering them up with the same. We believe in keeping the cars free from these sort of disfigurements, as in my opinion it induces the better classes to travel by the cars. Furthermore, the amount of money derived from these advertisements is so small that we can afford to do without the same."

In the United States the advertisements generally are confined to the inside of the car only, and no advertising is allowed on the outside of the cars, whereas in England, in some undertakings, they permit advertising both on the inside and outside of the cars.

In England the advertisements take the form of coloured glass for the inside, and enamelled iron plates for the outside.

When the coloured glass advertisements are adopted,

they are fixed either by cementing or by clipping in the upper panels of the car windows, these advertisements are then seen both from the inside and outside of the cars.

There is one disadvantage of the glass advertisements, and that is their number is limited very much. For instance, take a four-window car on the two sides, this will give eight windows and eight advertisements; with a six-window car, we get twelve windows and advertisements; whereas, if artistically printed advertising cards were allowed of uniform size, they could utilize the space to better advantage; to the extent of placing three of these cards in the same space now occupied by one glass panel; thus making the space more valuable, gaining an advantage whereby they would get twenty-four and thirty-six advertisements per car, instead of eight and twelve per car. It is obvious, therefore, that such space when utilized to greater advantage demands more money.

Then again, there are a great number of cars in operation, which do not have small upper glass panels above the windows, under such conditions the glass advertisements are not applicable.

The method of holding the card advertisements is to have a light framework, made of nicely polished wood, with a groove in, and the advertisements are held securely in this groove, just by being sprung in; this framework can be fitted at small expense in any type of car.

The advantage of the printed card method of advertising is:

1. More advertisements per car.

2. Owing to their small cost, the advertising matter on them can be frequently changed to suit the requirements of the advertiser.

3. It is only a few seconds' work to change them.

4. They are not so fragile or liable to damage as the glass ones.

5. They attract the attention of the passengers more readily (which is the object of advertising) than glass ones, because there is greater contrast, both as regards colour, make-up, design, general artistic finish and ability among the several advertisements.

6. They cannot be seen from the outside, but only on the inside.

For the above reasons, the author prefers the printed card method in preference to coloured glass ones, also, he does not believe in any advertisements, in any shape or form, being fixed to the outside of the cars, or being fixed inside so that they can be seen from the outside; as in his opinion, such outside advertisements do spoil the general pleasing appearance of the car; such advertisements giving the car a plastered appearance, to the general detriment of its artistic finish and appearance.

In summing up the contents of this section, the author's idea of organising this branch of the undertaking (in the case of extensive undertakings in large towns and cities with a good passenger traffic) is as follows:

1. No season tickets.

2. No workmen's tickets.

3. No privileges as regards fares of one section of the public over any other section of the public.

4. No return tickets.

5. The "universal" penny "all over" the system method, with transfers given by the conductor on the car; or to get rid of transfers—

6. The "universal" penny "one car" method, in which the passenger may ride any part or the whole of the distance in any direction on that car with no changes.

7. "Ticket" and "bell-punch" system of fare collecting.

8. Uniformed inspectors, to see that the conductor performs his duties satisfactorily.

9. Advertising on the cars.

10. By means of printed cards.

11. On the inside only.

Conditions 1 and 2 might possibly be modified somewhat to suit special local circumstances, such for instance as the Blackpool and Fleetwood Electric Tramways. In this case the tramways connect Blackpool and Fleetwood, two seaside towns separated by a few miles—the fare is 6*d.* each way. They have a very busy season during the summer months; there is also a railroad company which connects the two places—this railroad company grants "contract" tickets. Under such circumstances the author thinks monthly, quarterly, half-year and yearly contracts, and weekly tickets would be applicable.

END OF SECTION III.

SECTION IV.

Financial Reports—Tramway Accounts—Estimates of Costs—Specifications—Board of Trade Regulations, etc.

NEWCASTLE TRAMWAYS AND THE QUESTION OF DEPRECIATION.*

MR. BOWDEN (of the firm of Thomas Bowden, Son & Nephew, chartered accountants, Newcastle-on-Tyne), the professional auditor, has presented his report to the city council, date June 30, 1903, on the tramway system. We make the following extracts from this very timely and interesting document, and we believe they will command the attention of all who have anything to do with the finance or managerial departments of electric tramway systems :—

	£	s.	d.
The loans raised for tramway purposes amounted at March 25, 1902 (after deducting 6771*l.* 19*s.* 9*d.* repaid), to	683,228	0	3
Add, borrowed or transferred during the year, less instalments repaid and accrued . . .	90,397	5	9
Outstanding loans at March 25, 1903 .	773,625	6	0

During the year capital expenditure amounting to

* Taken from the *Electrical Review*, of July 31, 1903.

230,256*l.* has been incurred in connection with the undertaking. Balance, March 25, 1902, 673,338*l.*; further expenditure 230,256*l.* balance, March 25, 1903, 903,594*l.* The tramways were opened for traffic on December 16, 1901, and since that date a regular service has been maintained.

In my last report to the Council I mentioned that as the tramways system, so far as then completed, had only been in operation some three-and-half months, it was not considered that any useful purpose could be served by preparing a statement of profit and loss for that period; but revenue accounts for the periods from December 16, 1901, to March 25, 1902, and March 26, 1902, to March 25, 1903, have now been prepared.

These have been certified, and the table on page 206 is an abridged statement for the fifteen-and-half months ended March 25, 1903.

It is generally accepted that no balance on revenue or profit and loss account can be considered as profit, until adequate allowance has been made for that deterioration in value which the yearly expenditure for repairs is not sufficient to permanently check.

The rate of depreciation should be calculated on the probable "life" of the property under ordinary conditions, and should provide against the inevitable wasting of the asset, assuming that it is kept as fully repaired as possible out of revenue.

The conditions affecting municipal undertakings are somewhat different to those of private or public companies.

NEWCASTLE-UPON-TYNE CORPORATION TRAMWAYS.—ABRIDGED REVENUE ACCOUNT.

Expenditure.	December 16, 1901 to March 25, 1902.	March 26, 1902 to March 25, 1903.	Income.	December 16, 1901 to March 25, 1902.	March 26, 1902 to March 25, 1903.
	£ s. d.	£ s. d.		£ s. d.	£ s. d.
Power, sub-station and distribution expenses . .	2,056 14 4	8,703 4 8	Traffic receipts .	21,166 10 7	150,334 3 8
Public lighting .	..	460 14 11	Public lighting .	..	3,100 0 0
General expenses .	1,403 5 1	9,133 1 10	Rents, advertising and sundries .	4 13 6	387 16 0
Traffic expenses .	8,080 18 3	56,731 5 7			
Maintenance. .	1,436 8 5	14,284 15 2			
Balance . .	8,193 18 0	64,508 19 6			
	£21,171 4 1	£153,822 1 8		£21,171 4 1	£153,822 1 8

In the case of the latter, the capital of the subscribers, when once received, is not repaid until the winding up of the company; consequently careful provision is necessary before arriving at the divisible profit, in order that the capital may be preserved intact, and that present shareholders may not be unduly favoured by improper payments of dividends at the expense of those who may come after.

In the case of municipal undertakings, on the other hand, loans must be repaid within specified periods; and the general principle underlying the decision as to the term, is supposed to be the "life" of the work for which the loan is granted.

Hitherto, these loans have been principally in respect of works of an unremunerative or unrealisable nature, or both; but now that municipalities have entered more energetically into the sphere of trading, conditions not originally anticipated have arisen.

The loans for the tramways capital expenditure, under the Act of 1899, have been approximately granted on the following terms: permanent way, purchase of tramways and buildings, 30 years; machinery and electrical equipment, 20 years; cars, 15 years; although, in the Act of 1902, provision is made for the repayment of loans for equipment over 30 years.

If the property comprised under the above division has, in each case, a probable "life" equal to the term for which the loan to pay for it has been obtained, and provided always that on the expiry of the loan, permission will be granted to re-borrow, further depreciation than

the provision for the repayment of the loan would appear to be uncalled for.

It is generally acknowledged, however, that the probable "life" of certain of the assets of a tramway undertaking is shorter than the term for which the money is borrowed, and the consideration of the following questions becomes necessary.

(*a*) Whether such a sum shall be provided, in addition to the loans fund contribution, as will be sufficient to renew the asset at the termination of its useful "life" without having recourse to re-borrowing?

(*b*) Whether such a sum shall be annually set aside as will create a special repair fund, to maintain the system in a working condition, in addition to the contribution to the loans fund?

(*c*) Whether only such sums shall be charged yearly as will leave the asset comparatively valueless at the date when the repayment of the loan falls due, redemption having been provided for that purpose independently?

The conclusion arrived at on the consideration of these questions will serve as a guide to the basis on which depreciation is to be calculated.

It must be admitted that the experience with electric tramways being comparatively short in this country, it is difficult to estimate with precision the probable "life" of different sections of a tramway undertaking; but, in the light of such experience as has been gained, some precedents have been established, and a reference to these may be profitable.

Mr. D. McColl, of the Glasgow Corporation Tram-

ways, in a recently published book on tramway accounts, gives the following rates of depreciation *: permanent way, 450*l.* per mile of single track; rail-bonding, 7½ per cent.; ducts and man-holes, 2½ per cent.; feeder-cables, 3 per cent.; poles and rosettes, 3 per cent.; overhead wires, ———; section-boxes, say 4½ per cent.; buildings, 2½ per cent.; machinery and plant, works, 7½ per cent.; power and sub-stations, 5 per cent.; rolling stock, 7½ per cent.; furniture, 2½ per cent.; uniforms, 50 per cent.

He also suggests, as an alternative, in a table of estimated income and expenditure, that depreciation should be calculated at the rate of 2·20*d.* per car-mile.

"During my audit I have had interviews with your manager and engineer, Mr. A. E. Le Rossignol, and have seen the report on the subject of depreciation, presented by him jointly with the city engineer to the Tramways Committee."

In this report it is stated that "renewals can be met by laying aside annually a sum of 24,700*l.*," which it

* [While 450*l.* per annum per mile of single track is a very fair depreciation allowance for electric tramways, when confined to passenger traffic only, and under the most favourable conditions, it will be found, however, that when heavy goods and merchandise, and the rolling stock appertaining for such purposes (if allowable on the tramways), travel over the permanent way, that the "life" of the track will be considerably shortened, probably anywhere from 25 to 50 per cent., and the "depreciation" allowance must be raised to correspond. This shortening of the "life" and increased "depreciation" will to a certain extent be governed by the solidity of the track foundation, and on the weight and the shape of cross-section of the track; the author does not think that the "grooved" girder type of rail at present used, is the best form or shape of rail section for goods traffic and light railways.—AUTHOR.]

is intended should be invested and allowed to accumulate. I understand that this calculation is based on the average probable useful "life" of the assets.

Further, the opinion as expressed by Parliament may also serve as a guide to the rate of depreciation on machinery and plant, and evidence of this is forthcoming in what is now generally known as the "Dundee Clause," the latter part of which reads as follows:—

"Provided, that if in any year the revenue exceeds such expenditure, the Corporation shall carry such excess to a reserve account to be used in providing for deficiencies and contingencies, and that should there be a deficiency in any year it shall be provided for in the estimate for the following year by drawing from reserve account or varying the tolls, fares and charges, or reducing working expenses, or be carried to a suspense account and reduced gradually over a period of years not exceeding five.

"Provided also, that in making the estimates aforesaid and balancing accounts at the end of such year, the depreciation on machinery and plant shall be at 3 per cent. on the first cost thereof."

The rate mentioned in the "Dundee Clause" would appear to be the minimum that Parliament is at present disposed to consider should be provided on plant and machinery, in addition to the provision for repayment of loans.

By way of comparison, the approximate sums necessary to be provided, on the basis laid down by each of the authorities referred to, are submitted:—

(*a*) Messrs. Le Rossignol and Edge, in their report, consider that depreciation is taking place annually, amounting to 32,543*l.*, which could be met by investing and accumulating annually 24,700*l.* *Note.*—This amount would be slightly increased on the total expenditure to March 25, 1903.

(*b*) Taking the percentages of depreciation recommended by Mr. McColl, and calculating on the amount of value of property considered by Messrs. Le Rossignol and Edge to be depreciating at a greater rate than that allowed for the repayment of the loan, the annual sum required is 28,916*l.*

(*c*) Adopting Mr. McColl's bases as far as they apply calculating on the whole of the capital expenditure, and with a view to leaving a sufficient fund for the renewal of the undertaking, as well as leaving the same free of debt on the termination of the loans, the annual sum required would be 39,749*l.*

(*d*) Calculated on the basis of 2·20*d.* per car-mile, the amount required would be 30,984*l.* (Subject to increase when a full year's running on the whole system is obtained.)

(*e*) The "Dundee Clause" which deals with depreciation on plant and machinery only provides that 3 per cent. shall be set aside. This, in the case of Newcastle, would appear to be about 11,500*l.*

The first four of these suggestions have for their object the renewal of each asset on the expiration of its probable "life," thus keeping the system intact as well as leaving the undertaking free of debt at the termination of the loans period.

The principle of calculating depreciation according to the car mileage (*d*) has much to recommend it, as periods of heavy traffic, such as holidays, entail a greater depreciation than periods when fewer passengers are carried.

The "Dundee Clause" (*e*) deals *only* with depreciation on plant and machinery, and does not appear to provide for renewal of other assets, as, for instance, permanent way.

In the foregoing, depreciation only has been considered, but it is equally important that a reserve fund should be established to provide for any extraordinary expenditure that may become necessary in consequence of the "antiquation" of the whole or any part of the system.

Having regard to the comparative infancy of electrical science, there is every reason to anticipate that great changes may take place in the future, rendering existing systems liable to further heavy expenditure to keep pace with the altering conditions.

A reserve fund is therefore necessary, so that when the time comes the changes may be carried out without hardship to a future generation, who may be called upon to assume the remaining liability of the present loan debt.

The council have already before them an illustration of the necessity for considering this in the case of the old horse tramways. For some years to come the interest on the horse tramways loans will have to be provided, thus casting a burden on future ratepayers, who will have desired no corresponding benefit. The balance

available for depreciation and interest and redemption of capital is 69,452*l.* 10*s.* 1*d.*

The amount for interest on and redemption of loans during the period covered by the working of this system is 52,407*l.* 10*s.* 6*d.*

Deducting this from the above surplus, there remains a balance to the credit of revenue account of 17,044*l.* 19*s.* 7*d.*, available as the nucleus of a depreciation and reserve fund, the further annual provision for which will depend upon the basis decided upon by the Council.

The balance to the credit of sinking fund account, representing loans repaid, amounts to 33,710*l.* 14*s.*; the amount due to the city fund (for advances made during the construction period) after deducting 3000*l.* repaid, is 13,819*l.* 10*s.* 6*d.*, exclusive of interest which is in dispute.

Included in the assets there appears an item under the heading of "interest on, and redemption of loans during construction" of 20,093*l.* 2*s.* 5*d.*, which is to be written off out of revenue, as no power exists to capitalise, as is generally the case in the construction of large undertakings.

Horse Tramways.—Reference to the balance-sheet of the horse tramways will show that the liabilities of the corporation, in respect of loans and stock on this account, amounted to 46,662*l.* The available assets are as follows :—

	£	s.	d.	£	s.	d.
Cash on hand, capital account .	8,796	5	9			
,, revenue ,, .	5,822	10	10			
				14,618	16	7
Stores estimated to realise				284	10	0
Debtor				60	17	6
				£14,964	4	1

An amount due in respect of an outstanding debt, 442*l.* 16*s.* 10*d.*, is disputed, and is not included.

	£	*s.*	*d.*
The invested balance necessary, as at March 25, 1903, to provide, without further contribution, for the redemption of outstanding loans in 1925, should have been	24,352	4	0
The amount actually to the credit of this fund, as shown by the account was	15,216	4	0
Leaving a further sum to be invested of . .	£9,136	0	0

It seems important that an investment should at once be made of the cash in hand on capital account, and of so much of the balance on revenue account as may be necessary to make up this amount.

This would then leave a balance of 5,828*l.* 4*s.* 1*d.* available for the yearly payment of interest, amounting to about 1,530*l.*, which would suffice for nearly four years to come. After this balance has been exhausted, the interest in respect of these loans will become a charge on the rates, unless taken over by the tramways committee.

This worked out to 23,854*l.* for the periods that the money had been expended and the tramways opened; being 5¼ per cent. on 153,864*l.*, the amount expended for the eighteen months to March 31, 1902, and the same percentage on the total outlay of 223,541*l.* for the year ending March 31, 1903. The amount actually set aside was 27,426*l.*, and the cost of renewals to March 31, 1903, had been 1189*l.*, leaving 26,237*l.* in-hand.

In the remarks that are intended to cover these figures it is stated, that although the sum set aside is

Depreciation and Renewals Fund of the Sunderland Corporation Tramways.

The following details are taken from the report :—

—	Capital Expended to March 31, 1903.	Estimated "Life," (years.)	Per-centage.	Annual Amount to be Set Aside.
	£			£
Rails, fish-plates, sole-plates, tie-bars and bolts	40,567	12	8	3,248
Points and crossings	4,125	6	17	701
Excavating and concrete, etc.	25,619	30	$2\frac{1}{10}$	537
Wood pavement	8,922	7	$14\frac{3}{7}$	1,272
Granite pavement	15,145	16	6	912
Whinstone and local setts pavement	19,206	12	8	1,536
Bonds	2,844	12	8	225
Booster	503	10	10	50
Poles and brackets	8,094	20	5	405
Excavation and concrete	593	30	$2\frac{1}{10}$	13
Trolley-wire, guard-wire and fittings	3,183	8	$12\frac{1}{2}$	400
Frogs and crossings	61	3	33	20
Cables	4,951	20	5	250
Conduit casing and boxes	6,630	30	$2\frac{1}{10}$	139
Section-boxes	591	30	$2\frac{1}{10}$	13
Land, etc., for street improvement	100	50	2	2
Buildings	52	40	$2\frac{1}{2}$	2
	141,186			
Car-bodies	17,330	15	$6\frac{2}{3}$	1,142
Trucks	6,900	20	5	345
Motors and electrical equipment	15,364	20	5	770
	39,594			
Purchase on undertaking, cost of Act, etc.	47,035	30	$2\frac{1}{10}$	987
Land and car-sheds	29,623	30	$2\frac{1}{10}$	621
Tools and machinery	1,013	10	10	100
	258,451	about $5\frac{1}{4}$		13,690

over the estimate given above, 5000*l.* has also been invested as a further reserve fund, in accordance with the provisions of the Act, and they are now building up an accident reserve fund of 2000*l.*, of which 911*l.* 3*s.* 9*d.* has been contributed during the last two years.

TRAMWAY DEPRECIATION.*

By WM. R. BOWKER, C.E.

Re your excellent reference in regard to the above in your issue of March 4, you do, from time to time, give good advice to consulting and constructing engineers; but in the majority of cases it apparently goes unheeded.

It is high time that tramway engineers should do some solid thinking with reference to the future. In my opinion the "Southampton" experience is only the forerunner of a "series" of very expensive experiences, which numerous corporations will undergo long before the year 1910 arrives.

The first and highly essential step in tramway construction should take the form of a solid "concrete" foundation all the way across the track bed, from 6 to 12 inches deep (according to the nature of the ground), and should in width finish off at "not less" that 2 feet on the outside of each rail.

A second method is for the rails to be laid and

* This article (by the Author) appeared in the *Electrical Review* of March 18, 1904.

"spiked" on wooden "sleepers," and the sleepers completely embedded in good solid concrete; and a third method, more suitable for light railways through country, is for the rails to be spiked on good "creosoted" sleepers, the rails resting on "metal tie-plates," to prevent the rails cutting into the sleepers, and the whole track to be well "ballasted."

It is, of course, needless to say that such a track foundation should be well drained, but how often is this highly important condition ever given a thought.

It is absolutely a "useless" waste of time and money to place rails upon a "poor" foundation, and adopting heavy rails, welded joints, heavy fish-plates, anchoring beams, etc., are under such conditions only patching up, for the time being, what is in the very beginning a "bad job."

Turning our attention to the track itself. As regards the smooth running of the car, the following conditions are essential: (*a*) Track lengths "level" on the "tread" of the rail; (*b*) true to gauge; (*c*) wide grooves; (*d*) curves of large radii; (*e*) grooves free from stones, dirt, sand, etc. These conditions, in addition to tending to smooth running of the car wheels, affect the "resistance to traction" (and, therefore, the power consumed per car) and also the "life" of the rails; additional conditions which affect the "life" of the rails are nature and steepness of gradients, composition of the rails, kind of traffic on track (whether "passenger" or "merchandise," with heavy rolling stock), and last, but not least, the "weight" of the rails, and the form of the "cross-section" of the rail.

These last two conditions are easily controlled by "specification," and there ought to be no reason why engineers should not make departures from existing conditions.

In my book, "Practical Construction of Electric Tramways" (Spon), I recommend that the weights of rails should vary from 95 to 120 lb. per yard.

As to the question of the form of rail section, I am of the opinion, taken from a "durability" point of view, that the rail section can be greatly improved on; and the "life" of the rail depends at the outset more on its form than on any other condition (neglecting, of course, its metallurgical composition).

From a "tractive resistance" and "consumption of power" point of view, the "grooved girder type" of rail, as generally adopted, is the very worst type possible. A better form from this standpoint is the "step girder rail," and, better still, the "T-headed girder rail."

Whereas under average conditions the "tractive resistance" for "grooved girder rails" is about 30 lb. per ton, ditto for the "step girder rail" is about 18 to 20, and for the "T-headed girder rail" about 12 to 15 lb. per ton. The only advantage which a "grooved girder rail" possesses is that it enables the street pavement to be more readily and closely laid. It has several very great disadvantages. Cars do not keep the track better on a "grooved girder rail"; in fact, it is otherwise. The "step girder" and T-headed girder rails are safer, and in going round curves they only need "guard rails."

In fact, "grooved" girder rails should never be used

on tramways or light railways laid through country where there is no pavement.

The proper rail for light railway construction is, in my opinion, the T-headed girder type, because (*a*) it is safer; (*b*) it has less "tractive resistance"; (*c*) it is more "durable"; and (*d*) for reason (*c*) it is more "practicable" and "commercial" for the rolling stock used in the carriage of merchandise; (*e*) a lighter weight rail with greater durability can be built in this form than any other.

The Hampshire Light Railway (recently constructed) have used the "grooved girder rails" on the ballasted track through country; I believe it would have been a wiser policy to have used T-headed rails.

In my opinion the present type of "grooved" girder rail can be improved, especially in the distribution of metal.

The force of this suggestion will be more readily realised when the existing tramways have had the experience of rolling stock carrying heavy merchandise passing over them.

On the question of "depreciation allowance," the majority of the tramway undertakings are taking the "average" life of the track as ten or twelve years, and are allowing about 450*l.* per annum per mile of single track. I should suggest that they take respectively seven or eight years and 600*l.* per annum as their basis.

A number of extensive tramway undertakings are contemplating the "carriage of merchandise"; this is to be confined to night and early morning, and the "pas-

senger traffic" during the other hours; under such conditions they will find that five years will be nearer the "average" life of the track (and they will have to allow "depreciation" accordingly), because "goods traffic" abuses the track more than "passenger traffic."

With "continuous vibration," due to continuous traffic, a rail becomes "tired," and the fibrous structure of the metal of the rail assumes a "crystalline" formation; this is one of the reasons of "short life," also why a rail deteriorates more rapidly towards the end of its life than at the beginning,

In conclusion, I beg to offer a hint for serious investigators. The "track" is utilised (in the case of the "overhead" system) as a return circuit for the electric current, and I suggest that this "polarises" the "molecular structure" of the metal, and, in so doing, affects the life of the rail.

I, therefore, suggest that samples of rails before installation, and after being in use for some time, should be submitted to chemical and microscopical observation. I believe that the knowledge thus gained will be of incalculable practical and commercial value to the tramway world, and have a great bearing on the future. If such "polarisation" does occur, with detrimental results, then some of the present methods of installations will have to be altered.

EXTRACTS FROM REPORTS OF ELECTRIC TRAMWAY ACCOUNTS.*

BRADFORD AND SHEFFIELD MUNICIPAL TRAMWAYS.

These two Yorkshire municipal tramway enterprises have both given excellent account of themselves during the past year. In both cases a transformation to electrical working has recently taken place, and under enterprising management their route mileages have been greatly extended.

The Bradford tramways system, as will be seen, is of greater extent than that of Sheffield, and at the same time serves a smaller population.

Both systems contain many severe gradients. In the case of Bradford, power is purchased from the electric lighting department; while the Sheffield tramways department possesses its own power plant, and in addition builds most of the rolling stock in its own car-works.

It is interesting to note that the earnings per car-mile are very similar in both cases. For Bradford, with its extended system, the result is a very good one; and at Sheffield the figure has, no doubt, been reduced by the greater car-mileage run and more frequent services.

The units used per car-mile are much higher than the average, as a natural consequence of the hilly nature of the routes.

The working expenses at both towns are somewhat

* Appeared in the *Electrical Review*, Jan. 1, 1904.

GENERAL STATEMENT.

	Bradford.	Sheffield.
For 12 months ending	March 31, 1903	March 25, 1903
Length of route, miles	40	30
Total length of track, miles	68	58
Number of cars in use	(Total) 200	(Average) 143·85
Car-miles run	4,013,191	4,777,146
Passengers carried per annum	41,000,000	54,946,915
Capital expended to date	750,000*l.*	953,572*l.*
Traffic receipts	170,115*l.*	206,729*l.*
Total receipts	173,534*l.*	208,963*l.*
Working expenses	117,496*l.*	129,916*l.*
Gross profit	56,038*l.*	79,047*l.*
	d.	*d.*
Income per car-mile	10·37	10·49
Working expenses per car-mile	7·02	6·53
Interest and sinking fund per car-mile	2·16	2·21
Sundry	..	·12
Total expenses per car-mile	9·18	8·86
Profit or loss per car-mile	1·19	1·63
Cost of energy per car-mile	1·61	·71
Average fare per passenger	1·0	·90
Revenue per mile of route	4,338*l.*	6,965*l.*
Expenditure per mile of route	2,937*l.*	4,330*l.*
Total number of units used	6,067,387	7,369,539
Units used per car-mile	1·5	1·5

above the normal, as might be expected from the working conditions prevailing.

Sheffield, with its own power plant, has a consider-

ANALYSIS OF WORKING EXPENSES.

Year ending 1903.	Bradford.		Sheffield.	
	Gross.	Per Car-Mile.	Gross.	Per Car-Mile.
	£	d.	£	d.
Traffic expenses, including wages of employés, car-shed expenses, tickets and uniforms . .	(approx.) 43,305	2·60	86,513	4·35
Electrical energy . . .	26,932	1·61	14,081	·71
Management and general expenses, including salaries, printing, stationery, insurance, law and sundry	(approx.) 6,087	·36	6,440	·32
Rent, rates and taxes . . .	6,524	·39	6,065	·30
Rent of lines, Saltaire and Shipley	2,129	·13	..	..
Repairs and Maintenance :—				
Track	5,759	·34	3,404	·18
Overhead equipment . .	1,804	·10	4,864	·24
Cars, tools, etc. . . .	24,956	1·49	7,929	·40
Buildings, power equipment .	..	..	620	·03
Total working expenses . .	117,496	7·02	129,916	6·53
Percentage of working expenses to receipts, 1903 . . .	67·5 per cent.		62 per cent.	

able advantage in the item for energy per car-mile, although in order to compare with the Bradford figure (for purchased energy) an allowance for financial charges on the power station and plant must be added ; this, of

course, being included in the Sheffield profit statement, and omitted in the case of Bradford.

PROFIT STATEMENT.

—	Bradford.	Sheffield.
	£.	£.
To interest on loans . .	36,188	27,810
To sinking fund . . .		16,125
To depreciation and renewals from revenue . . .	..	2,378
To balance carried down .	19,850	28,168
Less interest brought forward from 1902 . . .	..	146
To deficit on horse section, closed November, 1902 .	..	4,712
Gross profit on year's working	£56,038	£79,047

On the year's working the Bradford tramways department earned a gross profit of 56,038*l.*; from this, interest and sinking fund absorbed 36,188*l.*, and a balance of 19,850*l.* was carried forward for the Committee to deal with.

The Sheffield department, out of its handsome gross profit, provides for financial charges: a sum of 2378*l.* (provided out of revenue) for depreciation and equipment renewals; the deficit from the horse section, closed in November 1902, absorbs 4712*l.*; and, deducting a small item of accumulated interest, we get a balance on the year's working of 28,168*l.*

The total accumulated surplus of this and previous years amounted to 106,956*l.*, and out of this it was pro-

posed to grant sums as follows: relief of rates, 13,980*l.*; school of modern languages, 100*l.*; music in parks, 250*l.*; contingencies, 10,000*l.*; and renewals fund, 20,000*l.*, leaving a balance of 62,626*l.*

With the latter items no one can find fault, and we heartily commend the "second thoughts" of the committee in their recommendation for a renewals fund, which is based on a sum equivalent to 1*d.* per car-mile run, as also the committee's opinion that the surplus should be used primarily for the benefit of the tramways undertaking.

Southport and Wallasey Municipal Electric Tramway Accounts.*

We record this week an analysis of the returns of the Southport and Wallasey tramway undertakings for the period ending March 1903. Both these concerns have to deal with, and depend largely on holiday traffic.

The working expenses in both cases are good for small concerns, Wallasey's higher figure being partly due to extra cost of energy on gradients.

Both concerns purchase energy from the lighting departments, and the cost would therefore be higher than in the case of undertakings having their own tramway power station.

The respective percentages of working expenses, etc., are representative of the working conditions of the two systems.

* Taken from the *Electrical Review*, Jan. 15, 1904.

GENERAL STATEMENT.

—	Southport.	Wallasey.
For 12 months ending	March 31, 1903.	March 31, 1903.
Length of route	8 miles	9 miles
Total length of track	10·7 miles	11 miles
Number of cars in use	(over) 14	(over) 23
Car-miles run	418,324	654,742
Passengers carried per annum.	3,535,434	5,685,182
Capital expended to date	116,852*l.*	120,503*l.*
Total receipts	16,387*l.*	31,475*l.*
Working expenses.	11,231*l.*	19,195*l.*
Gross profits	5,155*l.*	12,280*l.*
	d.	*d.*
Income per car-mile	9·40	11·53
Working expenses per car-mile	6·44	7·03
Interest and sinking fund per car-mile	3·65	1·93
Total expenses per car-mile	10·09	8·96
Profit or loss per car-mile	−·69	+2·87
Cost of energy per car-mile	1·87	2·43
Average fare per passenger	1·098	1·30
Revenue per mile of route	2,048*l.*	3,497*l.*
Expenditure per mile of route.	1,408*l.*	2,133*l.*
Total units used	458,472	979,133
Units used per car-mile	1·16	1·49

As a result of the poor year at Southport, the financial charges amounting to 6378*l.*, more than absorbed the available gross profit, and as a result a debit

ANALYSIS OF WORKING EXPENSES.

—	Southport.		Wallasey.	
	Gross.	Per Car-mile.	Gross.	Per Car-mile.
	£.	*d.*	£	*d.*
Traffic expenses, including wages of employés, car-shed expenses, tickets, uniforms . . .	5,897	3·38	8,190	3·02
Electrical energy . . .	3,155	1·84	6,630	2·43
Management and general expenses, including salaries, printing, stationary, insurance, law and sundry	677	·39	2,138	·77
Rent, rates and taxes . . .	867	·50	280	·10
Repairs and Maintenance :—				
Track	187	·08	97	·03
Overhead equipment . .	132	·07	473	·17
Cars, etc.	316	·18	1,379	·50
Buildings	..	..	8	·01
Total working expenses . .	11,231	6·44	19,195	7·03
Percentage of working expenses to receipts	68 per cent.		61 per cent.	

PROFIT STATEMENT.—*For year ending March* 31, 1903.

—	Southport.	Wallasey.
	£	£
Interest	3,493	3,773
Sinking fund . . .	2,885	1,508
Depreciation and renewals fund	..	4,500
Balance carried down . .	— 1,223	2,499
Gross profit . . .	£5,155	£12,280

balance of 1223*l.* was made. The financial charges are higher in proportion than many tramway undertakings, and they, in conjunction with other adverse circumstances, have tended to the poor result.

As regards the Wallasey figures, the combination of favourable circumstances led to a gross profit of 12,280*l.*, which was not much diminished by the deduction of the comparatively small financial charges.

The department has wisely contributed a substantial amount to start a depreciation and renewals fund, and a substantial balance remains in hand.

ELECTRIC TRACTION FINANCE.

In the *Street Railway Journal*, (14 pp., 721 to 724,) 1898, is an article on the relative costs of running, etc., on the horse, cable and electric sections of the New York street railways. A brief *résumé* of it follows :—

The number of passengers carried is about 250,000,000 per year.

The comparisons extend over twelve months.

Percentage car-mileage of each system was—

Horse	46
Cable	20
Electric conduit	34

In the last quarter the percentage had changed to—

Horse	34
Cable	27
Electric	39

The receipts from these sections were—

	Per mile of track. £	Per car-mile. d.
Horse	2,000	14·4
Cable	9,760	16·65
Electric	4,250	13·00

For the twelve months the operating expenses are—

	Car-mile. d.
Horse	8·94
Cable	8·21
Electric	5·12

For the last three months—

	Cost per car-mile. d
Horse	8·95
Cable	8·78
Electric	5·03

During the twelve months period—

	Operating expenses. Percentage of receipts.
Horse	65·3
Cable	47·7
Electric	37·9
Entire system	53·3

For the last three months—

	Operating expenses. Percentage of receipts.
Horse	62·1
Cable	52·7
Electric	38·6
Entire system	50·9

This article shows that where, as in New York, the conditions are favourable to the conduit, that that system is superior to either horse or cable traction in both economy and traffic capacity.

Coming now to the United Kingdom, where generally speaking the solidarity of construction is the equal of the very best American practice, but where the mileage will generally be much smaller. The cost of getting the

necessary powers, the initial cost of construction will be higher, and the returns will probably be somewhat lower. But the evidence is still unmistakably in the direction of greater efficiency, economy, and higher returns from the electrical system.

The late Dr. John Hopkinson, F.R.S., estimated as follows for the twenty miles of double track for the City and County of Newcastle-on-Tyne, the electrical equipment being overhead trolley with bonded rail return.

From the published report of the New Tramways Committee of the City and County of Newcastle-on-Tyne.

NEWCASTLE-ON-TYNE TRAMWAYS.

SCHEDULE No. I.

	£	s.	d.
Trolley wire—40 miles erected complete with insulators	7,593	0	6
Poles for two trolley wires—20 miles	14,582	7	0
Bonding rails—40 miles	3,713	0	0
Cables—6 miles of 0·34 square inch section	3,300	0	0
* Cars—132 at 560*l.* per car (12 being spare), and two spare trucks with motors complete	74,600	0	0
Boilers—Seven, each of 40 horse-power, with mechanical stokers, steam-pipes and economiser	8,958	0	0
Engines—Three condensing, each of 875 horse-power	12,075	0	0
Dynamos—Three	5,715	0	0
Cranes—Two	446	0	0
Switchboards and instruments	1,000	0	0
Track—40 miles at 5000*l.* per mile	200,000	0	0
Rails at two car sheds, complete with bonds	2,100	0	0
Car sheds—Area, 5554 square yards	18,050	10	0
Engine house, Boiler house, Economiser, Chimney — Area = 1603 square yards	6,744	17	0
Total	£358,877	14	6

* This price is for a 51 passenger car (22 inside and 29 outside). If a 42 passenger car is used the price would be slightly lower.

SCHEDULE No. II.—*Cost of Working per Car-Mile.*

Number of car-miles run per week = 120 × 6·5 × 8 × 18 = 112,320.

	d.	d.
Electric car sheds—		
Wages of attendants, materials, etc.	0·100	
Generating station—		
Coal	0·128	
Oil, waste, etc.	0·032	
Wages	0·036	
	0·196	
Management and office, engineers' salaries	0·150	
Wages of car-drivers and conductors	1·840	
		2·286
Depreciation or renewals, being 10 per cent. on total capital outlay, except rolling stock, which is taken at 12½ per cent.	1·551	
Interest on total capital outlay at 3 per cent.	0·442	
		1·993
		4·279
Legal expenses, insurance, rates, taxes and contingencies—10 per cent. on combined totals, i.e., on 4·279		0·427
Total		4·706

SCHEDULE No. III.— *Cost of Working per Annum.*

Number of Car-Miles run per Annum, 5,840,640.

	£	£
Electric car sheds	2,433·600	
Generating station	4,769·856	
Management and office, engineers' salaries	3,650·400	
Wages of drivers and conductors	44,778·240	
		55,632·096
Depreciation or renewals and repairs	37,745·136	
Interest	10,766·331	
		48,511·467
Legal expenses, insurance, rates, taxes and contingencies		10,415·808
Total		£114,559·371

SCHEDULE No. IV.—*Cost of Maintenance per Car-Mile.*

	Newcastle. *d.*	Zurich. *d.*
Maintenance of track	0·845	0·263
„ engines, „ boilers, „ dynamos	0·110	0·054
„ rolling stock	0·382	0·213

Mr. W. N. Colam's estimate for the same twenty mile of double track tramways to be worked by cable is given below.

SHEET A.—*Estimated Cost of Construction and Equipment.*

	£	£
40 miles single track, allowance as agreed upon for excavation, concrete, track-rails, paving laid to city engineer's specification, all complete, at 5000*l.*	200,000	
40 miles single line of cable tube with slot rails, pulleys, hatches, connections with sewers, allowance for temporary turnouts to keep tramway traffic going, and for alterations to pipes in road, etc., complete for cable, at 3649*l.*	145,960	
Points and crossings, inclusive of double-track junctions, turnouts and termini	9,450	
Diverting pits, with machinery and blind tubes for all junctions	22,300	
		377,710
Engines and gear, cable drives, tensions, etc. . .	20,400	
Boilers, pipes, pumps, heaters, etc. . . .	10,500	
Auxiliary engines and gear for machine shop and other purposes	750	
		31,650
132 cars, complete, at 230*l.*	29,040	
150 grippers, at 40*l.*	6,000	
240 tons cables, at 32*l.*	7,680	
		42,720
Total estimated cost for construction and equipment . .		£452,080

SHEET B.—*Estimated Cost of Operating per Annum.*

	£	£	Per car-mile. d.
Motive power—			
Wages, including all men in engine and boiler room	650		·026
Coals for main engines, auxiliary engines, and machine shop, 10,056 tons at 6*s.*	3,017		·121
Water, 14,482,345 gallons at 6*d.* per 1000	362		·014
Oil, waste, packing, etc., etc.	150		·006
Total for motive power		4,179	·168
Maintenance—	£		
Cars and grippers—Wages	2,760		
Materials	1,380		
	4,140		·166
Permanent way—			
Wages	1,250		
Materials	750		
	2,000		·080
Pulleys, tube, way, etc.—			
Wages	1,825		
Materials	4,975		
	6,800		·274
Cables—			
Wages	680		
Materials	5,464		
	6,144		·247
Engines and boilers—repairs, etc.	405		·016
Total for maintenance		19,489	·785
Total for maintenance and motive power		23,668	·953

SHEET C.

	£	£	Per car-mile. d.
Traffic—			
Wages	28,192		1·132
Tickets and car stationery	1,376		·055
Uniforms	720		·029
Lighting, licences and sand	250		·010
Water	9		·000
Total for traffic		30,547	1·230

	£	£	Per car-mile. d.
Management—			
Salaries of manager, head and assistant engineers, secretary, clerks, traffic superintendent	3,150	. .	·127
Audit fees	60	. .	.002
Lighting, stationery, telephone and miscellaneous	260	. .	·010
Insurance on accidents	840	. .	·034
Printing and stationery	100	. .	·004
Insurance other than for accidents	..	. .	..
Total for management	——	4,410	·177
Total for traffic and management	. .	34,957	1·408
Total for maintenance and motive power	. .	23,658	·953
Total for motive power, maintenance, traffic and management	. .	58,615	2·361
Total for depreciations	. .	10,602	·427
Interest, 3 per cent. on expenditure of 460,000*l.*	.	13,800	·556
Grand total	. .	£83,017	3·344

SHEET D.—*Depreciation, not including Renewals and Repairs, as provided for on Sheet B.*

	£	£
Track rails and setts (say)	100,000 at 16 years	6,250
Slot rails	24,800 at 20 ,,	1,240
Engine and gear	26,500 at 25 ,,	1,060
Boilers, etc.	12,000 at 20 ,,	600
Cars, etc.	29,040 at 20 ,,	1,452
Total for depreciation		£10,602

In the recent official return of the finances of the Leeds City Tramways the following figures are given for the year ending 25th March, 1899:—

Horse Tramways—

Total car mileage	989,320 miles
Total receipts	40,436*l.*
Receipts per car-mile	9·81*d.*
Working expenses per car-mile	10·17*d.*

Steam Tramways—

Total car mileage	479,775 miles
Total receipts	23,603*l.*
Receipts per car-mile	11·8*d.*
Working expenses per car-mile	10·33*d.*

Electrical Tramways—

Total car mileage	934,368 miles
Total receipts	48,033*l.*
Receipts per car-mile	12·34*d.*
Working expenses per car-mile	4·83*d.*

The expenses are exclusive of interest on capital or sinking fund, and depreciation changes; and the management expenses have been equally divided between the three systems.

J. Young, Esq., in his report to the Glasgow Tramways Committee on the desirability of testing the conduit system there, concludes that the thirty-seven miles of double track there would cost about 10,000*l.* more per mile of double track than for the trolley system. And assuming 122,000 car-miles per year per mile of single track, the interest, sinking fund, and all other items of extra cost should not exceed 1*d.* per car-mile.

Accumulator Traction Costs.—The returns for this class are so very varied and far apart that it is difficult to draw conclusions.

At Hanover the plates are estimated to last some 2500 car-miles; at Dresden 1434 car-miles, or from 2 to 2⅓ years. A reserve of 10 per cent. of accumulators is required at Hanover for overhauling; the cells are overhauled after 625 miles at a cost of per year about 35*l.*

per car. At Dresden the returns for repairs are between ·6 and ·8 of 1*d.* per car-mile, which is too low.

The committee of the Corporation of Blackpool visited and obtained information *re* accumulator traction, for the purpose of adopting it at Blackpool. A brief epitome of their conclusions follows:—

Weight of battery for an 11 ton car carrying 86 passengers would be 5½ tons for a 5 mile trip.

Or 86-passenger car—

Car	11 tons
Passengers	6 ,,
Battery	5½ ,,

50-passenger car—

Car	7½ tons
Passengers	3¾ ,,
Battery	3¾ ,,

Battery for one large car	370*l.*
,, ,, small ,,	247*l.*
Containing case for battery	15*l.*

As there were six large and ten small cars the total cost runs out at 4930*l.* for installing.

The tenders received for overhead trolley gave 3377*l.* as cost of installing.

Hence from a point of view of capital the difference is large, and then the life of the accumulators is much less than would be the case with overhead work.

Cost of maintaining the accumulators was given as 1·6*d.* per car-mile for the large accumulators and 1·7*d.* for the small ones.

The mileage then was 200,000 yearly, and was estimated at 228,640, hence total cost of maintenance.

	£	£
Ten small cars	637	1209
Six large cars	572	

To this must be added the cost of extra current for the accumulators due to their added weight, and the loss of efficiency in the cells.

This figures out at 1*d.* per unit to 1023 per year.

Or the total cost per year using accumulators—

	£	£
Interest on capital	567	2,799
Cost of upkeep of cells	1,209	
Cost of extra current	1,023	

The then existing conduit was costing 2238*l.* per year.

The same plant to be maintained on the overhead trolley system would cost not more than 600*l.*

The extra weight of accumulator cars demands heavier tracks and gives more wear and tear on the cars and track.

Approximate Cost of Various Parts of Electric Traction System.*

By Philip Dawson, Esq.

Approximate Cost of Modern Power Plant per kilowatt installed.

	£	s.	d.		£	s.	d.
Buildings	4	0	0	to	16	0	0
Boilers	2	0	0	to	5	0	0
Steam and water piping and feed pumps	0	12	0	to	3	0	0
Steam engines and condensers	3	0	0	to	11	0	0
Dynamos and switchboards	2	10	0	to	12	0	0
Total cost of power plant, not including buildings	25	0	0	to	35	0	0

* Taken from *Fowler's Electrical Engineers' Pocket-Book*, 1904, p. 284.

Approximate Cost of Rolling Stock.

	£
Maximum traction trucks, per set . .	130
Ordinary bogie trucks, per set . . .	125
Standard four-wheel truck	70
Extra long truck	75
Double-deck car bodies	220 to 300
Single-deck car bodies	210 to 265
Double motor equipment, including resistances and controllers	260 to 320
Single-car motor, 15–50 horse-power . .	75 to 120

Cost of Track Laying.

Cost per mile of single track, 4 feet 8½ inches gauge, 100-lb. rails, wood or granite paving, including necessary electrical bonding : 5500*l.* to 6500*l.*

Overhead Work.

Cost per mile, 3-section, tubular poles, standard brackets, 1·0 trolley wire—

	£		£
Double trolley wire on side brackets . .	1100	to	1400
„ „ on span wire . .	1700	to	2000
„ „ on centre brackets .	1300	to	1500
Single „ side brackets . .	1000	to	1200
„ „ span wire . . .	1600	to	1800

From recent enquiries made from various corporations who have carried out the work with their own staff, as regards the "average" cost of permanent way, excluding bonding, but including all special work, per mile of single track, the following figures were obtained.

	Per Mile of Single Track. £
Newcastle-on-Tyne	8500
Oldham	8400
Rochdale	6200
Hull	5750
Plymouth	5900

While some of the above figures (Rochdale, Hull and Plymouth) are near the average, the Newcastle and Oldham figures are rather high.

In the majority of cases it will pay corporations to let out this work by contract, as generally the contractor can carry out the work on a more systematic basis, more quickly, and at a less cost, ranging from about 5 to 10 per cent.

This is due to the fact that contractors are more experienced in the business.

It may be taken that 6000*l.* to 7000*l.* per mile of single track (not conduit) is a very good average.

Comparing the cost of permanent way on the conduit and overhead systems: Mr. Robert Kaye Gray, in his recent presidential address, delivered on Thursday, November 12, 1903, before the Institution of Electrical Engineers, states that the "conduit" system has cost London per mile of single line about 14,000*l.*; and that an "overhead" installation would have cost 7000*l.*

On referring to a recent report (1902) of the Finance Committee of the London County Council, they say that in considering some estimates, it is desirable to compare them with the preliminary forecast of 15,000*l.* per mile of single track, which the Council had generally

understood to be the approximate cost of converting the tramways for electric traction.

It appeared that that figure included provision for cars, and the power to work them, at the rate of only 2½ cars for each mile of single track, whereas most of the London tramways were equipped with a much larger number of cars.

Taking, however, the allowance adopted for the forecast, the cost per mile of single track of the lines now under consideration worked out at about 18,000*l.*

The cost of the Tooting lines, on the same basis, and according to the tenders accepted for most of the works, amounted to 17,670*l.* per mile.

J. Young, Esq., in his report (some time ago) to the Glasgow Tramways Committee on the desirability of testing the conduit system there, concluded that the thirty-seven miles of double track would cost about 10,000*l.* more per mile of double track than for the trolley system.

The author thinks that it may be taken as a safe estimating basis, that the "conduit" track system costs more than double that of the "overhead" system for equal lengths of track; and, bringing it down to a closer estimate, about 2¼ to 1.

The author on referring to a recent article (January 1903) on the future of the electric railway, over the signature of Major-General Wm. A. Bancroft, President of the Boston Elevated Railway Co., states that the cost of laying track in America, works out at about $40,000 (over 8,000*l.*) per mile to lay tracks on the highway; and

it costs from $1,000,000 (over 200,000*l.*) to $2,000,000 (over 400,000*l.*) to build a mile of tunnel before any tracks are laid. (He is here referring to subway construction.—AUTHOR.)

SPECIFICATIONS.

CROYDON TRAMCARS.—SUMMARY.

Type of Car.—To be double deck, capable of seating thirty passengers inside, and thirty-eight passengers outside. Cars to be mounted on maximum traction trucks.

Gauge of Line.—4 feet 8½ inches.

Life Guards.—A sum of 12*l.* per car to be reserved for this item to be expended as directed by the engineer.

Trucks.—To be either of Peckham or Brill standard maximum traction type, roller bearings being fitted to all journals. Diameter of driving wheels to be thirty inches.

Motors.—Two to be supplied per car, of the G. E. 52 type.

Wearing Depth of Commutator.—1 inch radial, or 2 inch from diameter.

Ratio of Gear.—To be 1 in 4·78.

Weight of Motor.—Weight of motor, complete with gear case, not to exceed 1750 pounds.

Test.—All insulation to stand 2500 volts alternating between windings and frame, for 15 consecutive minutes.

Controller.—To be of the General Electric Company of America's B 18 type, arranged with rheostatic brake.

Trolley Pole.—To be of the enclosed spring swivelling-arm type, 16 feet long, fitted with Wood's spherical swivelling trolley head.

Date of Delivery.—To be made by tenderers, also the dates of commencement and number per week thereafter.

Penalty for Late Completion.—1 per cent. of value of each car late.

Terms of Payment.—Up to 75 per cent. of value of labour expended and materials delivered on site during construction; an additional 12½ per cent. on completion of the work; the remaining 12½ per cent. twelve months later.

Period of Maintenance.—Twelve months from date of completion.

Ilford Electric Tramcars.—Summary.

Extent of Contract.—Supply of (*a*) twelve 56-passenger complete electrically equipped tramcars; (*b*) six 69-passenger electrically equipped cars; (*c*) four 32-passenger trailer cars.

Types of Car Bodies.—(*a*) To be double-decked, with reversed staircases, suitable for 4 feet 8½ inch gauge, to seat 56 passengers, 22 inside and 34 outside; (*b*) to be double-decked, with reversed staircases, to seat 69 passengers, 30 inside and 39 outside; (*c*) to be single-deck open summer type trailer cars with platform, and seating accommodation for 32 passengers.

Type of Trucks.—(*a*) To be of four-wheeled type, supported by eight spiral springs and four double-leaf springs; (*b*) to be of maximum traction type, two trucks being provided for each car body in accordance with usual practice; (*c*) to be of steel, of usual design offered for trailer cars.

Length of Wheel Base.—For standard four-wheel truck, 6 feet; for maximum traction type, 4 feet.

Diameter of Wheels.—To be thirty inches in the case of all driving wheels, and maker's standard in the case of the pony wheels of the maximum traction truck.

Wheel Guarantee.—Wheels giving out before having run 30,000 miles, other than by stripping the flange, to be replaced by contractor free of charge.

Life Guards.—Of approved type, to be provided for each car.

Brakes.—Of maker's standard type, if approved by the engineer as satisfactory, to be fitted to each car.

Type of Motor.—Two motors to be provided per car, each capable of exerting a tractive effort of not less than 1100 lbs. at the periphery of a 30-inch wheel when the car is travelling at a speed of not less than eight miles per hour.

Ratio of Gearing.—Not to exceed 5 to 1.

Permissible Temperature Rise.—Not to exceed 100° F. above surrounding atmosphere after one hour's run at full load, and 140° F. above surrounding atmosphere when 47 amperes has been passed through motor for a period of one hour.

Pressure Test.—2000 volts alternating current for a period of one hour.

Controllers.—To be of the series parallel type, fitted with electrical emergency brake.

Trolley.—To be of the swivelling-arm type, fitted with trolley head of Wood's or other approved type. The tension on the wire to be adjustable by hand, between 20 and 30 pounds.

Equipment Accessories.—The usual accessories to be provided and fitted on the cars.

Brake Test.—After delivery, each car to be tested by running a trial trip fully loaded. The brake to be capable of bringing a fully loaded car to a standstill on the level within a distance of fifty feet when running at a rate of twelve miles per hour.

Bogie Cars.—To be fitted with electrical equipments of similar type to those on cars specified above.

Specified Dates of Delivery.—To be stated by tenderers for each type of car. Early delivery is essential.

Penalty for late Completion.—One per cent. of total contract sum for each week late.

Terms of Payment.—During progress of work, up to 80 per cent. of value of work delivered and executed on site; 10 per cent. on completion; 10 per cent. at end of twelve months period of maintenance.

Sureties.—Two to be provided, to be jointly and severally bound with successful tenderer in a sum equal to 20 per cent. of contract price.

LONDON COUNTY COUNCIL TRAMWAYS.—SUMMARY.

Extent of Contract.—Supply of either fifty or one hundred completely equipped electric tramcars for use on the Tooting section of the Council's tramways.

Type of Car.—To be of tenderer's standard designs, so far as he deems desirable. The car is, however, to be double-deck, with reversed staircase, and capable of seating in all between 64 and 70 persons.

Gauge of Line.—4 feet 8½ inches.

Limiting Dimensions.—Given, but tenderer to supply with his tender full particulars of those actually proposed.

Sand Boxes.—Of the Ham or other approved type to be supplied, two for each car.

Life Guards.—A sum of 15*l.* per car to be reserved for expenditure on this item, at the discretion of the engineer.

Roof Seats.—To be of the garden lath-and-space type with reversible swing backs.

Type of Truck.—Each car to be fitted with two maximum traction trucks, but every tender must contain at least two alternative prices for other standard types of bogie trucks.

Wheel Base.—To be 4 feet.

Arrangement.—Each truck to be so designed that, under normal conditions, not less than 75 per cent. of the weight carried by the truck comes upon the axle of the driving wheel.

Mean Diameter of Tread of Driving Wheels.—30 inches.

Mean Diameter of Tread of Pony Wheels.—20 inches.

Wheels.—To be steel-tired, with cast-iron centres. Alternative offers may be made for chilled-iron wheels.

Diameter of Main Parts of Axles.—Driving axles not less than 4 inches, pony axle not less than $3\frac{3}{4}$ inches.

Brake.—Hand brake to be worked by means of a hand wheel, placed at either end of car, to be provided. To be of sufficient power to stop loaded car within a distance of 50 feet, when the car is travelling at the rate of 12 miles per hour. An electric brake is also to be provided, mentioned below; and, when used in conjunction with the hand brake, it is to be capable of stopping a loaded car, travelling at the rate of 12 miles per hour, within its own length.

Motors.—Two to be provided per car, capable when working together to accelerate a loaded car at the rate of at least 1 foot per second on the level; and to maintain a steady speed of 12 miles per hour on any gradient up to 1 in 80, and eight miles per hour on a gradient of 1 in 22.

Current.—The voltage of the current is 500 to 550 volts, and it will be conveyed to the motors by means of conductors placed in an underground conduit, and collected by means of a plough to be supplied with the car, and made in accordance with the drawing supplied with the specification.

Design of Motors.—To be in accordance with latest

modern practice, armature coils being wound in separate sections, so that they are easily removable.

Insulation Test.—Armature and field-magnet windings to withstand a pressure of 2000 volts alternating for a period of 30 minutes.

Tests.—Exhaustive tests of each motor are to be made in the presence of the representative of the Council before delivery.

Temperature Rise.—At the end of one hour's full load, test temperature rise of any accessible part of winding not to exceed 135° F. above surrounding atmosphere.

Controller.—Two to be provided per car, of the rheostatic brake type, complete with all suitable resistances.

Other Accessories.—An automatic minimum cut-out, a main-switch, and a watt-hour meter to be provided on each car, also provision for connecting an ammeter in circuit if required.

Car Lighting.—Twenty-two lamps to be fitted per car, of which twenty will be in use at once, in position named in the specification.

Illuminated Destination Boxes.—To be provided as specified.

Extras.—A sum of 40*l.* per car to be allowed for disbursement at the discretion of the engineer.

Board of Trade.—All Board of Trade requirements are to be strictly complied with.

Specified Dates of Delivery.—Tenderer for either section of fifty cars to give dates at which he can undertake to deliver the cars quoted for. Attention is called to the fact, that it is expected the car sheds will be ready for

the cars in October 1902, but the tenderer must be willing, if necessary, to store the cars until wanted, free of cost to the Council.

Penalty for Late Delivery.—5*l.* per car per week.

Specified Term of Payment.—80 per cent. on delivery of cars into the Council's car-sheds; 10 per cent., on taking over; 10 per cent. at end of 12 months.

Period of Maintenance.—Twelve months from date of taking over of work.

ELECTRIC TRAMWAYS—BOARD OF TRADE REGULATIONS.

Regulations made by the Board of Trade, under the provisions of special Tramways Acts, or Light Railway Orders, authorising lines on public roads; for regulating the use of electrical power; for preventing fusion or injurious electrolytic action of or on gas and water pipes or other metallic pipes, structures, or substances; and for minimising as far as is reasonably practicable injurious interference with the electric wires, lines and apparatus, of parties other than the company, and the currents therein, whether such lines do or do not use the earth as a return.

First made, March 1894; revised, April 1903.

Definitions in the following Regulations.

The expression "energy" means electrical energy.

The expression "generator" means the dynamo or

dynamos, or other electrical apparatus, used for the generation of energy.

The expression "motor" means any electric motor carried on a car and used for the conversion of energy.

The expression "pipe" means any gas or water pipe, or other metallic pipe, structure or substance.

The expression "wire" means any wire or apparatus used for telegraphic, telephonic, electrical signalling, or other similar purpose.

The expression "current" means an electric current exceeding one-thousandth part of one ampere.

The expression "the company" has the same meaning as in the Tramways Act.

Regulations.

1. Any dynamo used as a generator shall be of such pattern and construction as to be capable of producing a continuous current without appreciable pulsation.*

2. One of the two conductors used for transmitting energy from the generator to the motors shall be in every case insulated from the earth, and is hereinafter referred to as the "line"; the other may be insulated throughout, or may be uninsulated in such parts and to such extent as is provided in the following regulations, and is hereinafter referred to as the "return."

3. Where any rails on which cars run, or any conductors laid between or within three feet of such rails, form

* The Board of Trade will be prepared to consider the issue of regulations for the use of alternating currents for electrical traction on application.

any part of a return, such part may be uninsulated. All other returns or part of a return shall be insulated, unless of such sectional area as will reduce the difference of potential between the ends of the uninsulated portion of the return below the limit laid down in regulation 7.

4. When any uninsulated conductor laid between or within three feet of the rails forms any part of a return, it shall be electrically connected to the rails at distances apart not exceeding 100 feet, by means of copper strips having a sectional area of at least $\frac{1}{16}$ of a square inch, or by other means of equal conductivity.

5. When any part of a return is uninsulated it shall be connected with the negative terminal of the generator, and in such case the negative terminal of the generator shall also be directly connected, through the current indicator hereinafter mentioned, to two separate earth connections, which shall be placed not less than 20 yards apart.

Provided that in place of such two earth connections the company may make one connection to a main for water supply, of not less than 3 inches internal diameter, with the consent of the owner thereof and of the person supplying the water; and provided that where, from the nature of the soil or for other reasons, the company can show to the satisfaction of an inspecting officer of the Board of Trade that the earth connections herein specified cannot be constructed and maintained without undue expense, the provisions of this regulation shall not apply.

The earth connections referred to in this regulation

shall be constructed, laid and maintained so as to secure electrical contact with the general mass of earth, and so that an electro-motive force not exceeding four volts, shall suffice to produce a current of at least two amperes from one earth connection to the other through the earth; and a test shall be made at least once in every month to ascertain whether this requirement is complied with.

No portion of either earth connection shall be placed within 6 feet of any pipe, except a main for water supply of not less than 3 inches internal diameter, which is metallically connected to the earth connections with the consents hereinbefore specified.

When the generator is at a considerable distance from the tramway the uninsulated return shall be connected to the negative terminal of the generator by means of an insulated return conductor, and the generator shall have no other connections with earth; and in such case the end of the insulated return connected with the end of the uninsulated return shall be connected also through a current indicator to two separate earth connections, or with the necessary consents to a main for water supply, or with the like consents to both in the manner prescribed in this regulation.

If the current indicator cannot conveniently be placed at the connection of the uninsulated return, with the insulated return, this instrument may consist of an indicator at the generating station connected by insulated wires to the terminals of a resistance interposed between the return and the earth connection or connections. The

said resistance shall be such that the maximum current laid down in regulation 6 (1) shall produce a difference of potential not exceeding one volt between the terminals. The indicator shall be so constructed as to indicate correctly the current passing through the resistance when connected to the terminals by the insulated wire before-mentioned.

6. When the return is partly or entirely uninsulated, the company shall in the construction and maintenance of the tramway—

(*a*) So separate the uninsulated return from the general mass of earth, and from any pipe in the vicinity.

(*b*) So connect together the several lengths of the rails.

(*c*) Adopt such means for reducing the difference produced by the current between the potential of the uninsulated return at any one point, and the potential of the uninsulated return at any other point.

(*d*) So maintain the efficiency of the earth connections specified in the preceding regulations, as to fulfil the following conditions, viz.—

(1) That the current passing from the earth connections through the indicator to the generator, or through the resistance to the insulated return, shall not at any time exceed either two amperes per mile of single tramway line, or 5 per cent. of the total current output of the station.

(2) That if, at any time and at any place, a test be made by connecting a galvanometer or other current indicator to the uninsulated return, and to any pipe in

the vicinity, it shall always be possible to reverse the direction of any current indicated by interposing a battery of three "Leclanché" cells connected in series if the direction of the current is from the return to the pipe, or by interposing one Leclanché Cell if the direction of the current is from the pipe to the return.

In order to provide a continuous indication that the condition (1) is complied with, the company shall place in a conspicuous position a suitable, properly connected, and correctly marked current-indicator, and shall keep it connected during the whole time that the line is charged.

The owner of any such pipe may require the company to permit him at reasonable times and intervals, to ascertain by tests that the conditions specified in (2) are complied with as regards his pipe.

7. When the return is partly or entirely uninsulated, a continuous record shall be kept by the Company of the difference of potential during the working of the tramway between the points on the uninsulated return. If at any time such difference of potential between any two points exceed the limit of seven volts, the Company shall take immediate steps to reduce it below that limit.

8. Every electrical connection with any pipe shall be so arranged as to admit of easy examination, and shall be tested by the Company at least once in every three months.

9. Every line and every insulated return or part of a return, except any feeder, shall be constructed in sections not exceeding one-half of a mile in length; and

means shall be provided for isolating each such section for purposes of testing.

10. The insulation of the line, and of the return when insulated, and of all feeders and other conductors, shall be so maintained that the leakage current shall not exceed one-hundredth of an ampere per mile of tramway. The leakage current shall be ascertained daily, before or after the hours of running, when the line is fully charged. If at any time it should be found that the leakage current exceeds one-half of an ampere per mile of tramway, the leak shall be localised and removed as soon as practicable, and the running of the cars shall be stopped, unless the leak is localised and removed within twenty-four hours. Provided that where both line and return are placed within a conduit, this regulation shall not apply.

11. The insulation resistance of all continuously insulated cables used for lines, for insulated returns, for feeders or for other purposes, and laid below the surface of the ground, shall not be allowed to fall below the equivalent of 10 megohms for a length of one mile. A test of the insulation resistance of all such cables shall be made at least once in each month.

12. Where in any case, in any part of the tramway, the line is erected overhead, and the return is laid on or under the ground, and where any wires have been erected or laid before the construction of the tramways, in the same or nearly the same direction as such part of the tramways, the Company shall, if required to do so by the owners of such wires, or any of them, permit such owners to insert and maintain in the Company's line one or

more induction-coils or other apparatus, as approved by the Company, for the purpose of preventing disturbance by electric induction. In any case in which the Company withhold their approval of any such apparatus, the owners may appeal to the Board of Trade, who may, if they think fit, dispense with such approval.

13. Any insulated return shall be placed parallel to, and at a distance not exceeding 3 feet from the line, when the line and return are both erected overhead, or 18 inches when they are both laid underground.

14. In the disposition, connections and working of feeders, the Company shall take all reasonable precautions to avoid injurious interference with any existing wires.

15. The Company shall so construct and maintain their system as to secure good contact between the motors and the line and return respectively.

16. The Company shall adopt the best means available to prevent the occurrence of undue sparking at the rubbing or rolling contacts in any place, and in the construction and use of their generators and motors.

17. In working the cars, the current shall be varied as required by means of a rheostat containing at least 20 sections, or by some other equally efficient method of gradually varying resistance.

18. When the line or return, or both, are laid in a conduit, the following conditions shall be complied with in the construction and maintenance of such conduit:—

(*a*) The conduit shall be so constructed as to admit

of examination of and access to the conductors contained therein, and their insulators and supports.

(*b*) It shall be so constructed as to be readily cleared of dust or other débris, and no such accumulation shall be permitted to remain.

(*c*) It shall be laid to such falls, and so connected to sumps or other means of drainage, as to automatically clear itself of water without danger of the water reaching the level of the conductors.

(*d*) If the conduit is formed of metal, all separate lengths shall be so jointed as to secure efficient metallic continuity for the passage of electric currents. Where the rails are used to form any part of the return, they shall be electrically connected to the conduit by means of copper strips, having a sectional area of at least one-sixteenth of a square inch, or other means of equal conductivity at distances apart not exceeding 100 feet. Where the return is wholly insulated and contained within the conduit, the latter shall be connected to earth at the generating station or sub-station through a high resistance galvanometer, suitable for the indication of any contact or partial-contact of either the line or the return with the conduit.

(*e*) If the conduit is formed of any non-metallic material not being of high insulating quality and impervious to moisture throughout, the conductors shall be carried on insulators, the supports for which shall be in metallic contact with one another throughout.

(*f*) The negative conductor shall be connected with earth at the station by a voltmeter, and may also be

connected with earth at the generating station or sub-station by an adjustable resistance and current-indicator. Neither conductor shall otherwise be permanently connected to earth.

(*g*) The conductors shall be constructed in sections not exceeding one-half a mile in length, and in the event of a leak occurring on either conductor, that conductor shall at once be connected with the negative pole of the dynamo, and shall remain so connected until the leak can be removed.

(*h*) The leakage current shall be ascertained daily, before or after the hours of running, when the line is fully charged, and if at any time it shall be found to exceed one ampere per mile of tramway, the leak shall be localised and removed as soon as practicable, and the running of the cars shall be stopped unless the leak is localised and removed within twenty-four hours.

19. The Company shall, so far as may be applicable to their system of working, keep records as specified below. These records shall, if and when required, be forwarded for the information of the Board of Trade.

Daily Records.

Number of cars running.

Number of miles of single tramway-line.

Maximum working current.

Maximum working pressure.

Maximum current from the earth-plate or water-pipe connections—*vide* Regulation 6 (1).

Leakage current—*vide* Regulations 10 and 18 (*h*).

Fall of potential in return—*vide* Regulation 7.

Monthly Records.

Condition of earth-connections—*vide* Regulation 5.

Insulation resistance of insulated cables in megohms per mile—*vide* Regulation 2.

Quarterly Records.

Conductance of joints to pipes—*vide* Regulation 8.

Occasional Records.

Specimens of tests made under provisions of Regulation 6 (2).

Localisation and removal of leakage, stating time occupied.

Particulars of any abnormal occurrence affecting the electric working of the tramway.

BOARD OF TRADE,
7 WHITEHALL GARDENS, S.W.
April, 1903

STATUTORY RULES AND ORDERS FOR TRAMWAYS. REGULATIONS MADE BY THE BOARD OF TRADE AS REGARDS ELECTRICAL POWER (OVERHEAD TROLLEY SYSTEM) ON THE TRAMWAYS.

The Board of Trade, under and by virtue of the powers conferred upon them in this behalf, do hereby make the following Regulations for securing to the public reasonable protection against danger in the exer-

cise of the powers conferred by Parliament with respect to the use of electrical power on the overhead trolley system, on all or any of the tramways on which the use of mechanical power has been authorised by the proper authorities (hereinafter called the "tramways").

And the Board of Trade do also hereby make the following bye-laws with regard to the use of electrical power on all or any of such tramways :—

Regulations.

1. Every motor carriage used on the tramways shall comply with the following requirements, that is to say—

(*a*) It shall be fitted, if and when required by the Board of Trade, with an apparatus to indicate to the driver the speed at which it is running.

(*b*) The wheels shall be fitted with brake blocks, which can be applied by a screw or treadle, or by other means, and there shall be in addition an adequate electric brake.

(*c*) It shall be numbered inside and outside, and the number shall be shown in conspicuous parts thereof.

(*d*) It shall be fitted with a suitable fender, which will act efficiently as a life protector, and with a special bell or whistle to be sounded as a warning when necessary.

(*e*) It shall be so constructed as to enable the driver to command the fullest possible view of the road before him.

(*f*) It shall be free from the clatter of machinery, such as to constitute any reasonable ground of complaint either to the passengers or to the public.

2. No trailer carriage shall be used on the tramways except in the case of the removal of a disabled carriage.

3. Every carriage used on the tramways shall be so constructed as to provide for the safety of passengers, and for their safe entrance to, exit from, and accommodation in such carriage, and for their protection from the apparatus used for drawing or propelling the carriage.

4. Every carriage on the tramways shall, during the period between one hour after sunset and one hour before sunrise or during fog, carry a lamp so constructed and placed as to exhibit a white light visible within a reasonable distance to the front; and every such carriage shall carry a lamp so constructed and placed as to exhibit a red light visible within a reasonable distance to the rear.

5. The Board of Trade and their officers may from time to time and shall, on the application of the local authority of any of the districts through which the said tramways pass, inspect the carriages used on the tramways, and the working arrangements generally; and may, whenever they think fit, prohibit the use on the tramways of any of them which, in their opinion, are not safe for use.

6. The speed at which the carriages shall be driven or propelled along the tramways shall not exceed the rate of — miles per hour.

[*Note.*—Speeds will be fixed by the Board of Trade upon the recommendation of their inspecting officers, who will have regard to the circumstances affecting the several routes, such as gradients, density of traffic, etc. Unless such circumstances are specially favourable, a speed not exceeding eight * miles an hour is generally prescribed. Where reliable speed indicators are in use, higher speeds may be found allowable than would otherwise be permitted, and at all other places the speed shall not exceed the rate of — miles per hour; and the speed at which the carriages shall pass through facing points, whether fixed or movable, shall not exceed the rate of 4 miles an hour.

7. The electrical pressure or difference of potential between any suspended conductors used in connection with the working of the tramways by electrical power and the earth, or between any two such suspended conductors, shall in no case exceed 550 volts. The electrical energy supplied through feeders shall not be generated at or transformed to a pressure higher than 650 volts, except with the written consent of the Board of Trade, and subject to such regulations and conditions as they may prescribe.

8. The suspended conductors used in connection with the working of the tramways by electrical power shall be securely attached to supports, the intervals between which shall not, except with the approval of the Board of Trade, exceed 120 feet; and they shall be in no part at a less height from the surface of the

* This has been raised to twelve miles in some cases.

street than 17 feet, except where they pass under railway bridges.

9. The live wire shall be divided up into sections not exceeding (except with the special approval of the Board of Trade) one-half of a mile in length, between every two of which shall be inserted an emergency-switch, so enclosed as to be inaccessible to pedestrians.

10. No part of any electric line shall be used for the transmission of 300,000 watts, except with the consent in writing of the Board of Trade; and efficient means shall be provided to prevent this limit being at any time exceeded.

11. All electrical conductors fixed upon the carriages in connection with the trolley-wheel, shall be formed of flexible cables protected by india-rubber insulation of the highest quality, and additionally protected wherever they are adjacent to any metal, so as to avoid risk of the metal becoming charged.

12. The trolley standard of every double-decked carriage shall be electrically connected to the wheels of the carriage in such a manner as either to prevent the possibility of this standard becoming electrically charged, from any defect in the electrical conductors contained within it, or give a continuous warning signal to the driver or conductor. No passenger shall be allowed to travel on the roof of a carriage as long as there is risk of electric shock.

13. An emergency cut-off switch shall be provided and fixed so as to be conveniently reached by the driver, in case of any failure of action of the controller-switch.

14. If and whenever telegraph or telephone wires, unprotected with a permanent insulating covering, cross above, or are liable to fall upon, or to be blown on to, the electric conductors of the tramways, efficient guard wires shall be erected and maintained at all such places.

15. Where any accident by explosion or fire, or any other accident of such kind as to have caused, or to be likely to have caused, loss of life or personal injury, has occurred in connection with the electric working of the tramways, immediate notice shall be given thereof to the Board of Trade.

16. The passengers shall not have access to any portion of the electric circuit.

17. All electric mains, leads and connections used must be of ample size, and must be thoroughly insulated and protected by safety fuses or other cut-outs, which will operate to break the circuit before the current has risen to an amount which would cause any injurious heating of the conductors, and the length of any safety fuse in the clear shall not be less than two inches.

18. The sectional area of the conductor in any electric line laid or erected in any street, shall not be less than the area of a circle of one-tenth of an inch diameter, and where the conductor is formed of a strand of wires, each separate wire shall be at least as large as No. 20 standard wire gauge. Provided that this regulation shall not apply to any electric line connected to the rails, for the purpose of measuring the fall of potential in the return, and not otherwise connected with the electric circuit.

Penalty.

NOTE.—The company using electrical power on the tramways contrary to any of the above regulations is, for every such offence, subject to a penalty not exceeding 10*l.*; and also, in the case of a continuing offence, to a further penalty not exceeding 5*l.* for every day during which such offence continues after conviction thereof.

Bye-Laws.

1. The special bell or whistle shall be sounded by the driver of the carriage from time to time, when it is necessary, as a warning.

2. The entrance to and exit from the carriages shall be by the hindermost or conductor's platform, except at a terminus when the carriages are stationary.

3. The carriages shall be brought to a standstill whenever it is necessary to avoid impending danger, and immediately before reaching the following points :—

. . . . . .

4. A printed copy of the regulations and bye-laws shall be kept in a conspicuous position inside of each carriage in use on the tramways.

Penalty.

NOTE.—Any person offending against or committing a breach of any of these bye-laws is liable to a penalty not exceeding 40*s.*

The provisions of the Summary Jurisdiction Acts, with respect to the recovery of penalties, are applicable

to the penalties for the breach of these regulations or bye-laws.

Signed by order of the Board of Trade, this——day of——

Assistant Secretary, Board of Trade.

Requirements in Cases of Application to the Board of Trade for their Approval of the Plan and Statement relating to the Rail and Substructure of a Tramway.

There should be forwarded to the Board of Trade—

1. A drawing (in duplicate), consisting of a full sized section of the proposed rail and a full sized plan and elevation of the same, extending for about 9 inches on each side of the joint, and showing how the joint is proposed to be secured, and the electrical bonding.

There should be a statement on the drawing of the material, weight and length of the proposed rail and fish-plates, and of the depth and width of the groove, also whether the tramway is to be worked by mechanical power.

2. A drawing, on a scale of 2 inches to the foot (in duplicate), consisting of a plan, cross-section and longitudinal section of the permanent way and sub-structure of the tramway, and showing the mode of fixing the rails and chairs (if any) and the gauge ties (if any).

There should be a statement on this drawing of the nature of the paving proposed to be adopted between

the rails, and for a distance of 18 inches on the outside of the rails.

There should also be on this drawing a plan, on a scale of 1 inch to the foot, of the points proposed to be employed at single line passing-places and junctions.

The drawings in each case should be on tracing linen.

The names and addresses of the road authorities, with a copy of the undermentioned notice endorsed with the date and manner of service.

4. Tracings of the above drawings should also be served upon the road authorities, with a notice that any objections or representations may be brought before the Board of Trade within ten days from the date of such service.

Board of Trade Regulations for Electric Railways.*

Regulations prescribed by the Board of Trade under the provisions of the Railway Act, 190 , for regulating the employment of insulated returns, or of uninsulated metallic returns of low resistance, for preventing fusion or injurious electrolytic action of or on gas or water pipes, or other metallic pipes, structures or substances, and for minimising as far as is reasonably practicable injurious interference with the electric wires, lines and apparatus of parties other than the Company, and the currents therein, whether such lines do or do not use the earth as a return.

* These regulations only apply to railways constructed underground in metal-lined tunnels.

Definitions in the following Regulations.

The expression "energy" means electrical energy.

The expression "generator" means the dynamo or dynamos, or other electrical apparatus, used for the generation of energy.

The expression "motor" means any electric motor carried on a train and used for the conversion of energy.

The expression "pipe" means any gas or water pipe, or other metallic pipe, structure or substance.

The expression the "company" has the same meaning or meanings as in the Railway Act 190 .

Regulations.

1. Any machine used as a generator shall be of such pattern and construction as to be capable of producing a continuous current without appreciable pulsation.

2. One of the two conductors used for transmitting energy from the generator to the motors shall be, in every case, insulated from the earth, by means of insulators of a strong and durable material, so shaped as to offer great resistance to surface leakage, and is hereinafter referred to as the "line;" the other may be similarly insulated throughout, or may be uninsulated in such parts and to such extent, as is provided in the following regulations, and is hereinafter referred to as the "return."

3. Where any rails on which trains run, or any conductors laid within the metal-lined tunnels in which the railway is constructed, form any part of a return, such part may be uninsulated. All other returns or parts of a return shall be insulated.

4. When any uninsulated conductor forms any part of a return, it shall be electrically connected to the rails at distances apart not exceeding 100 feet, by means of copper strips, having a sectional area of at least $\frac{1}{16}$ of a square inch, or by means of equal conductivity.

5. When any part of a return is uninsulated, it shall be connected with the negative terminal of the generator, and in such case the negative terminal of the generator shall also be directly connected to the iron or other metal plates forming the lining of the tunnel, unless this lining is otherwise connected to the rails. In each case, the connection shall be made through a suitable current indicator.

6. The iron or other metal plates forming the lining of the tunnels shall be so made and connected together as to form a continuous metal tube.

7. Where any pipe is brought into the tunnel from outside, except any pipe belonging to the Company, which is not in metallic connection with or laid within six feet of any other pipe, means shall be provided to secure that no portion of the pipe outside the metal tube shall be in metallic connection with the tube or with any conductor of electricity within the tube.

8. When the rails form any part of the return they shall either be electrically connected, at intervals not exceeding 100 yards, to the metal tube by metallic conductors, which will not be appreciably heated by a current of 100 amperes, or they shall not be in any metallic connection with the metal tube except by means of the connections to the negative terminal of the generator.

In the latter case the rails shall be supported by sleepers of wood, and they shall be of such sectional area and so connected at joints and from one line of rails to another, and where necessary to supplementary conductors or feeders, that the difference of potential between the rails and the metal tube shall not in any part and under any working conditions exceed 10 volts. A test shall be made at least once in each month.

9. When the return is partly or entirely uninsulated a daily record shall be kept by the Company, of the difference of potential during the working of the railway between any two points of the uninsulated return at the time when the load is greatest. If at any time such difference of potential exceeds the limit of 7 volts, the Company shall take immediate steps to reduce it below that limit.

10. Every line and every insulated return shall be constructed in sections, and means shall be provided at or near each station for breaking the connection between sections.

11. The leakage current shall be tested daily, before and after the hours of running, with the working pressure, and duly recorded. Should the amount of this at any time appear to indicate a fault of insulation, steps shall at once be taken to localise and remove it.

12. The Company shall, so far as may be applicable to their system of working, keep records as specified below. These records shall be preserved for a period of twelve months, and shall, if and when required, be forwarded for the information of the Board of Trade.

Daily Records.

Number of trains running.
Maximum working current.
Maximum working pressure.
Maximum current from the rails to generator.
Maximum current from the metal tube to generator.
Leakage current—*vide* Regulation 12.
Fall of potential in return—*vide* Regulation 9.

Monthly Records.

Maximum difference of potential between rails and metal tube—*vide* Regulation 8.

Insulation resistance of conductors laid outside metal tube—*vide* Regulation 11.

Occasional Records.

Localisation and removal of leakage, stating time occupied.

Particulars of any abnormal occurrence affecting the electric working of the railway.

Board of Trade Regulations for Tramways and Light Railways Laid on Public Roads.

Clearance.—The space between the inner rails of a double line must to some extent depend upon the overhang of the cars. It is, however, necessary that there should be at least 15 inches between the sides of passing cars, and also a similar space between the side of a car,

and any standing work, such as lamp-posts, telegraph-posts, trolley wire standards (including centre standards for electrical traction), in a street.

The space between the kerb and the nearest rail depends to a great extent on what is shown on the plans deposited when lines were authorised.

On straight roads a minimum distance of 18 inches between the side of the car and the kerb is desirable, but in exceptional cases a distance of 15 inches might be allowed for short lengths. On curves a greater space would be required, in order to allow for the overhang of the car platform.

Where central poles are used for electric traction, any stone kerbing should not be left wide enough at the sides facing the rails to enable any person to stand upon it as a refuge.

Rails.—For mechanical traction it is generally considered that the weight of rails should not be less than 90 lb. per yard, 100 lb. being preferred.

The groove of the rail should not exceed $1\frac{1}{8}$ inch in width, but the Board of Trade are prepared to accept a groove not exceeding $1\frac{1}{4}$ inch on curves of less than one chain radius.

APPENDIX.

A NEW DANGER TO MUNICIPALITIES.*

WARNING FROM NEWCASTLE.

A SELECT Committee of the House of Lords last week did a thing which, though aimed in the first instance only at the Corporation of Newcastle-upon-Tyne, may have serious consequences much further afield. The thing calls for the attention of municipal reformers everywhere; for, unless action is taken during the next few weeks a dangerous precedent will be created, and a powerful weapon placed in the hands of the British Electric Traction Trust, in its battle against the right of British towns to manage their own affairs.

The facts are these. After a tough fight in the Council Chamber and in the city, Newcastle obtained, some years ago, an Act by which the Corporation at present works the city's system of electric trams. Over a million pounds has been spent in laying out the system, and in paving the main thoroughfares with wood pavement. The work, in spite of some early and costly errors, has been splendidly done, and the people of

* Taken from the *Manchester Guardian*, April 1, 1904.

Newcastle are proud of their municipal tramway service, which they are justified in thinking one of the finest in the country. The fight has been thoroughly won also; so much so that the very gentleman who demanded a poll against the municipal ownership proposal has, I believe, publicly admitted his mistake and said how glad he is he was beaten. Practically nobody now denies the wisdom of the public ownership movement, once so hotly opposed.

Nobody in the city, that is; but between Newcastle and Tynemouth there is a small private company, the Tyneside Tramways Company, who have apparently cast longing eyes on the much richer traffic within the city boundaries. Their system joins on to that of Newcastle at two points. In one case it is only joined by a short side-line belonging to the Company, which has been completed some time, but on which, I believe, no cars now run. On another road, however—the main road between North Shields and Newcastle—the two systems touch. Here the Corporation have built a waiting-room, and here passengers from the city eastwards at present change trams. Those leaving the city quit a neat car and leave a splendidly laid, smooth-running line for a vehicle covered with advertisements moving over a very shaky track indeed. The arrangement, however, has not been complained about by anyone that I have heard of, and there is little waiting. The Corporation also are prepared to agree with the Company for through bookings.

But this does not satisfy the Tyneside Tramways

Company, who are promoting a bill to enable them to obtain compulsory running powers over the Corporation line to the Central Station, Newcastle. This implies a complete disorganisation of the city traffic. People who come into Newcastle by tramway from the down-river towns served by the Tyneside Tramway Company do not as a rule want to go to the station, as there are plenty of trams. The Corporation trams running from the terminus of the Company's system, therefore, are taken to an equally central part of the town, Grey's Monument, and from there to the west end of the city. The traffic to the Central is already very congested, and on the street over which the Company want running powers there is already a two-minute service on Saturdays. In addition to this, every car at present running on it is a sightly object. The proposal of the Tyneside Company implies that they are to have the use of the city's system through, amongst others, its most crowded street for cars disfigured by advertisements and for a public who would almost certainly be entirely drawn from the city itself, for the people of the Company's own district are much more likely to come to the station by the new electric trains of the North-Eastern Railway Company.

The conduct of the Lords' Committee which last week endorsed the proposal of the Company has been humorously described to the writer by a councillor who was on the deputation to oppose the Company's bill. Lord Barnard was in the chair; and the evidence of the Company's witnesses was heard with all due respect.

Their lordships then intimated that they would hear local witnesses on the other side, but did not think it needful to listen to any expert evidence for the Corporation. The Traffic Managers of Glasgow, Manchester, Leeds, and Cardiff had been taken to London by the Newcastle Corporation to give evidence on their behalf and these were the gentlemen whose evidence five peers thought not worth listening to! However, they ultimately agreed to hear one, Mr. John Young, of Glasgow. The hearing was little better than an insult. Mr. Young gave his evidence in a remarkably straightforward manner, but the Committee were evidently paying no attention to him. One noble earl, putting his arm on the table, rested his head on it, and fell, or pretended to fall, asleep. When Councillor Adams afterwards complimented Mr. Young on his evidence, that gentleman admitted that he was so disturbed by the evident inattention of the Committee that he hardly knew how he had done, and was relieved to hear he had not made a mess of it.

The present position of the affair is this. The bill has to receive the assent of the Commons, but it comes before them with the approbation of the Select Committee of Law Lords appointed to hear the evidence. The Corporation is determined to fight the matter to the utmost, but it is clear that powerful influences are at work favouring the bill, and it will need more efforts than theirs to accomplish its defeat. Municipalisers throughout the country should organise an opposition to the measure, for if it becomes law a most dangerous pre-

cedent will be created. As it is, the Lords' Committee were sadly troubled to find a precedent for the course they were obviously determined to take, and were driven to use the voluntary arrangement whereby Manchester and Salford run their cars over one another's boundaries. Had they been able to quote a case where Parliament had granted compulsory running powers to a company over a corporate system, we may be sure they would have done so. The Tyneside Tramways Company claims that it is not connected with the British Electric Traction Trust, but there is no doubt the latter body will watch the case closely and, should the bill become law, work it to the injury of the municipalisation movement all over.

NOTE.—Since going to press, new and serious developments have arisen in the tramway world, as the above article will show. The Author has already anticipated that complications are very likely to occur on the important and extremely complicated problem of "running powers" over each other's systems.

On referring back to page 190 of this book, he throws out a hint that the Americans keep their systems separate and distinct, and gives the advantages thereof.

In his opinion this arrangement of "running powers" over each other's lines, is borrowed from the existing methods adopted by railway companies. The fact must not be lost sight of that "electric traction systems" and "railway companies" are working under different conditions, and that whereas it may be to the mutual advantages of railway companies, it is an open question whether it is of great advantage to tramway companies, especially where conflicting interests are at stake.

There appears to be a general lack of foresighted policy as regards the serious complications and expensive litigation which will in great probability certainly occur, unless the most careful thought and movements are adhered to.

In his opinion it is not a wise and foresighted policy to allow running powers over each other's lines, except on an amalgamation basis.

The question of the slight inconvenience to passengers of changing from one car to another, is simply a nonentity compared with the expensive complications and bitter experiences likely to arise with this combining of systems.

Tramway managers, committees and others must not lose sight of the fact, that these complicated combinations make a very "weak spot" in their systems, tending more and more to place them in the law courts; and it goes without saying that such experiences will take the "cream" of their hard-earned money.

At the present time, in the author's opinion (where harmonious combination does not exist), it is better to keep each system separate and distinct as regards passenger traffic, and run to "termini" where passengers can change from one car to another. Each system will be feeding the other to their mutual benefit; yet, at the same time, the "commercial" and working organisation of each system will be separate and distinct in itself, thus tending to the ideal arrangement of "simplicity" and strength.

Municipalisation of tramways is the thing for this country; and now is the time for municipal corporations, committees and corporation tramway managers to form themselves into a "close combination" for their mutual interests and protection.

There are many unforeseen circumstances which may possibly arise, due to complications caused by the running of cars over each other's lines or systems, which would certainly end in expensive litigation.

Of course, a number of municipal corporations pay an annual premium for an assurance company to take the "third party risks," but generally such conditions are limited to ordinary classes of accidents, etc. confined to a single system.

For instance, Glasgow are this year paying a premium of 14,000*l.* for "third party risks."

Now when complicated agreements in connection with "running powers" over each other's systems are entered into, thus incurring greater risks of "legal battles," it is very doubtful whether these assurance companies would take the risk, excepting they obtained a very heavy and proportionately increased percentage for the premium.

This question of "running powers" is a very dangerous proposition. It may not be out of place to enumerate a few of the conditions which would give rise to such complications.

System A has "running powers" over the lines of system B, a "strike" occurs on B's system such that all their traffic stops; but A's cars endeavour to run over the lines of B; the "strikers" on B's system become "riotous," and damage the cars and possibly the passengers of A's system. Now who is responsible, and who is to pay the damages?

A car of system A carrying passengers, while on the lines of system B, becomes derailed, due to a "defect" in the permanent way of system B, and before brought to rest, runs into a vehicle, damaging the vehicle and occupants as well as the passengers on the car. Who is responsible, and who has to pay the damages?

A car of system A, while running over the lines of system B, is damaged and some of the passengers are injured, caused by the permanent way of system B being blown up by a "gas explosion" in one of the gas mains of town B. Who is responsible, and who has to pay damages?

Now taking the case of Manchester and Salford, who possess such "running powers" over each other's lines; supposing any one of the above or other similar conditions did

arise, the first thing that each city would do would be to consult with their "legal" advisers, as to who was responsible.

The "adviser" of each city, would, of course, say that the other system was responsible, and if the committee and officials of each system were of the same opinion, and took the advice of the "legal" gentlemen, it would end in only one thing, and that is, fight it out in the "law courts."

The "judge" and jury decide who is responsible, and who pays the damages; and *not* the "legal" advisers.

It may be argued that the "agreements," made up mutually between themselves, cover all these contingencies; but in the Author's opinion, there never was an "agreement" yet made which covered these and suchlike conditions so as to confine the entire responsibility to one or the other. Then again, who makes up these "agreements"; not, of course, the judge and jury who settle the case. The persons who advise on the outline of the agreements are the same "advisers" who say that the other one is responsible. Such "agreements" are always full of "loopholes" for escape; this is the "art" of making up these agreements; and there never was an agreement yet made which protected one party to the entire exclusion of the other under various complicated conditions; true, they appear strong and to cover every point, but the "law courts" soon expose the "weaknesses" and "loopholes" of the agreements.

The tramway system pays for these "experiences" and "legal" battles, and the financial obligations due to the attorneys, experts, and other expenses, may amount to a sum varying from several hundreds to several thousands of pounds.

"Prevention" is better than paying for suchlike experiences, and it behoves tramway undertakings to be very careful about coming into agreements *re* the "running powers" over each other's lines.

Tramway corporations should combine and oppose any bill which is for "compulsory running powers."

It might be a wise policy for large tramway undertakings to lay aside an annual sum of money as a "legal expense fund," in addition to their depreciation, reserve and renewal fund.

There is no doubt but that the "interchange" of traffic with "running powers" over each other's systems, within certain confined and mutually interested areas, is an excellent arrangement as regards traffic organisation.

The success or failure of this depends upon what form of agreement it is based. To overcome this difficulty, in a case like Manchester and Salford, the Author thinks the best solution of the problem would be to bring about a "close combination" or "amalgamation" of the systems, working under the advice of a "committee of delegates" elected by the two corporations in combination with the two general managers, which would make it practically one working organisation composed of two mutually interested undertakings.

This would remove all legal difficulties as regards accidents, maintenance of permanent way, question of damages, etc., and prevent the financially suicidal and disastrous policy of legal battles between gigantic enterprises, which are so closely related that the "ideal" in their case can only be "harmonious combination."

For the mutual protection of "municipal" tramway undertakings, the Author thinks that a "Municipal Tramways Association" should be formed at the earliest possible date.

His idea would be to have the Association composed of a committee of delegates; one delegate (say the chairman of the tramways committee) to be elected by the tramways committee of each and every municipal tramway undertaking.

This committee of delegates could elect a "managing committee" (chosen from among themselves) of say five or seven, including the chairman of the committee. They would have say a permanent "secretary" and an "honorary" or "permanent treasurer" with headquarters in London.

Such an arrangement would afford a very strong and close combination, it being a convenient neutral ground where the

various undertakings could meet on friendly terms, and agree upon measures of concerted action; also afford one another the benefit of their mutual experience in devising measures for the common good.

It would also be headquarters for the gathering of information on up-to-date developments, both as regards different problems and methods of tramway engineering, details on rolling stock, passenger and goods traffic organisation, traffic rates, passenger fares, details on permanent way, as regards life and durability of rails, joints, points and crossings; "chemical composition," and forms and weights of rails; overhead equipment, surface contact and conduit systems, and other numerous and important questions appertaining to tramways.

Also questions of depreciation, reserve and renewal funds, and a suggested "legal fund."

Such an "Association" would be of incalculable mutual benefit to the tramway world, and could be started in a substantial manner by each and every municipal tramway undertaking subscribing say 250*l.* to 500*l.* to a common fund as a "financial working basis," and say, an annual sum of 50*l.* or 100*l.* thereafter.

This initial fund would form a fund large enough to provide most of the money needed to fight this question of "compulsory running powers" through Parliament. This legal battle will come on sooner or later.

It is only fair and just for the common and mutual interests of municipal undertakings that each and every one should combine and subscribe to such a fund, because all alike will benefit by the results; it will be very one-sided and unfair to allow, say about a half dozen undertakings like Manchester, Liverpool, Glasgow, Newcastle, Leeds, Bradford, Sheffield, etc. to fight this legal battle. This will cost many thousands of pounds; what is required is a solid combination; split the financial obligations and all benefit by it.

Adverting to this system of "compulsory running powers," it is extremely difficult for "electric tramways" to come to a

mutually fair and equitable agreement. While there are several reasons, one in particular is worthy of deep thought, viz. that it is not possible with "electric tramway" systems, to arrive at definite and pre-determined figures per "car-mile" for running costs.

For instance, take the case of one item in the running costs, viz. the cost of "electric energy"; supposing there was an "interchange" of traffic between system A and system B, the conditions might be that system A were generating their own energy at say ·8*d.* per "kilowatt hour," whereas system B may be purchasing their energy at say 1½*d.* to 2*d.* per "kilowatt hour." This is a cause for disagreement which presents a difficulty.

It may appear surprising, but still it is a fact that (up to the present) no settled and equitable form of agreement with respect to "running powers" has been generally admitted or adopted either in the United States or this country.

The "Board of Trade" regulations do not provide for it, as their act referring to such is extremely vague.

To my mind, they will have eventually to arrive at one "logical" and "fundamental" principle, viz. that no profit is to be made by either company out of the other (as regards fares, payment for energy, running expenses, maintenance, etc.); and yet each company will make a profit indirectly out of the other, due of course, from an "increased" traffic which naturally results when the convenience of the public is recognised and catered for.

There is no doubt whatever but that "running powers" over each other's system is the proper order of things; and I am greatly in favour and strongly advocate "through working and running," but it should be left to "mutual agreement" and not "compulsory."

This "agreement" would have to provide for :—

(1) A pre-arranged service with limit of route.

(2) Conformity to regulations and scale of charges.

(3) Special and extra service to be subject to special agreement.

(4) Each party to be solely liable for any accidents (unless caused by the wilful negligence of the other) to persons or property in the district of the other.

(5) Other similar limitations and protective clauses.

In conclusion, I beg to suggest that if "compulsory" running powers become lawful, then to make such a condition of any value, the "Board of Trade" will have to make lawful a "compulsory" standard 4 ft. 8½ in. gauge.

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